DOCUMENT RESUME

ED 352 828	FL 020 858
AUTHOR	Barker, Chris, Ed.; Dowty, David, Ed.
TITLE	SALT II: Proceedings from the Conference on Semantics and Linguistic Theory (2nd, Columbus, Ohio, May 1-3, 1992). Working Papers in Linguistics No. 40.
INSTITUTION	Ohio State Univ., Columbus. Dept. of Linguistics.
PUB DATE	Jul 92
NOTE	435p.
PUB TYPE	Collected Works - Conference Proceedings (021)
EDRS PRICE	MF01/PC18 Plus Postage.
DESCRIPTORS	Adverbs; Arabic; *Grammar; Hindi; *Language Patterns; Language Research; *Linguistic Theory; Negative Forms (Language); Plurals; Pragmatics; *Semantics; Uncommonly Taught Languages
IDENTIFIERS	Anaphora; Ellipsis; Singular Forms (Grammar)

ABSTRACT

Papers from the conference on semantics and linguistic theory include the following: "Definiteness, Existentials, and the 'List' Interpretation" (Barbara Abbott); "Strong and Weak Novelty and Familiarity" (Cleo Condoravdi); "The Singular-Plural Distinction in Hindi Generics" (Veneeta Srivastav Dayal);" Adverbial Quantification, Complex Conditionals, and Focus" (Kai von Fintel); "Focus and Ellipsis in Comparatives and Superlatives: A Case Study" (Jean Mark Gawron); "A Note on Interrogatives and Adverbs of Quantification" (Jeroen Groenendijk, Martin Stokhof); "On the Semantics and Pragmatics of 'dake' ('And Only')" (Yasunari Harada, Naohiko Noguchi); "VP (Verb Phrase) Ellipsis and Semantic Identity" (Daniel Hardt); "The Said and the Unsaid" (Laurence R. Horn); "Antecedent Contained Deletion in a Variable-Free Semantics" (Pauline Jacobson); "A Framework for Focus-Sensitive Quantification" (Manfred Krifka); "Expressing Negation" (William A. Ladusaw); "On the Interpretation of Three-Dimensional Syntactic Trees" (Friederike Moltmann); "Two Kinds of Indexicality" (Geoffrey Nunberg); "The Semantics of Number in Arabic" (Almerindo E. Ojeda); "Distributivity and Logical Form in the Emergence of Universal Quantification" (William Philip); "On Telescoping" (Massimo Poesio, Alessandro Zucchi); "'Or' and Anaphora" (Matthew D. Stone); "Intervention Effects, Monotonicity and Scope" (Henriette de Swart); and "Weak Islands, Individuals, and Scope" (Anna Szabolcsi). (MSE)

****
*   Reproductions supplied by EDRS are the best that can be made   *
*   from the original document.   *
****

ED352828

Working Papers in Linguistics

No. 40

SALT II

PROCEEDINGS OF THE SECOND CONFERENCE ON SEMANTICS AND LINGUISTIC THEORY

May 1-3, 1992

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

Edited by
Chris Barker
and
David Dowty

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Brian
Joseph
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

FL 020 858

July 1992

The Ohio State University
DEPARTMENT OF LINGUISTICS

BEST COPY AVAILABLE

The Ohio State University

Working Papers in Linguistics No. 40

SALT II

Proceedings from the Second Conference on Semantics and Linguistic Theory

Held at the Ohio State University
May 1-3, 1992

Edited by
Chris Barker and David Dowty

The Ohio State University
Department of Linguistics
222 Oxley Hall
1712 Neil Avenue
Columbus, Ohio 43201, USA
lingadm@ling.ohio-state.edu

July, 1992

All Rights Reserved

Copyright © 1992 by The Ohio State University

Preface

This volume includes working-paper versions of the research presented at the Second Conference on Semantics and Linguistic Theory (SALT II), held at Ohio State University from 1 May to 3 May, 1992. The local organizing committee (Chris Barker, David Dowty, and Craige Roberts) gratefully acknowledges the sponsorship of the College of Humanities, the Department of Linguistics, and the Center for Cognitive Science, all at Ohio State University. We would also like to thank our advisory committee (Greg Carlson, Gennaro Chierchia, Robert May, and Sally McConnell-Ginet), who were among those colleagues who provided us with copious and valuable advice and comments during all phases of organizing and running the conference. Our wonderful abstract reviewers provided thorough and prompt evaluations, and in many cases we were able to pass on their comments (anonymously) to the authors of accepted abstracts; many authors found this feedback to be quite helpful, as reflected in the acknowledgements of some of the papers in this volume. The authors especially are to be thanked for their sometimes considerable efforts towards reconciling our style and formatting requests with our early and relatively inflexible deadlines; without their zeal we could never have published this volume so promptly at such a high level of overall quality. Only one paper presented at the conference does not appear in this volume, namely, Angelika Kratzer's talk on 'Thematic Relations and the Semantics of Voice'. (In the table of contents, the names of invited speakers are set in boldface, but since Kratzer's name does not appear in the table of contents, let us note here that she also was one of our invited speakers.) In addition, however, we are pleased to be able to include papers by our two alternate speakers, Kai von Fintel and Friederike Moltmann. A number of local graduate students helped in various crucial ways, from driving to and from the airport to housing conference participants to running the registration table. These graduate students include Elizabeth Dalton, Paul Dinsmoor, Joyce Lambert, Robert Poletto, Mutonyi Nasiombe, Frederick Parkinson, and Darryl Wylie. Chriss Large and Marlene Payha also provided invaluable help and advice. Thanks to all of these people, and more.

The editors,

Chris Barker

David Dowty

Contents

Barbara Abbott	Definiteness, Existentials, and the 'List' Interpretation	1
Cleo Condoravdi	Strong and Weak Novelty and Familiarity	17
Veneeta Srivastav Dayal	The Singular-Plural Distinction in Hindi Generics	39
Kai von Fintel	Adverbial Quantification, Complex Conditionals, and Focus	59
Jean Mark Gawron	Focus and Ellipsis in Comparatives and Superlatives: A Case Study	79
Jeroen Groenendijk & Martin Stokhof	A Note on Interrogatives and Adverbs of Quantification	99
Yasunari Harada & Naohiko Noguchi	On the Semantics and Pragmatics of *dake* (and *only*)	125
Daniel Hardt	VP Ellipsis and Semantic Identity	145
Laurence R. Horn	The Said and the Unsaid	163
Pauline Jacobson	Antecedent Contained Deletion in a Variable-Free Semantics	193
Manfred Krifka	A Framework for Focus-Sensitive Quantification	215
William A. Ladusaw	Expressing Negation	237
Friederike Moltmann	On the Interpretation of Three-Dimensional Syntactic Trees	261
Geoffrey Nunberg	Two Kinds of Indexicality	283
Almerindo E. Ojeda	The Semantics of Number in Arabic	303
William Philip	Distributivity and Logical Form in the Emergence of Universal Quantification	327
Massimo Poesio & Alessandro Zucchi	On Telescoping	347
Matthew D. Stone	'Or' and Anaphora	367
Henriëtte de Swart	Intervention Effects, Monotonicity and Scope	387
Anna Szabolcsi	Weak Islands, Individuals, and Scope	407

Definiteness, existentials, and the 'list' interpretation

Barbara Abbott
Michigan State University

1. Introduction

The ultimate explanation for the definiteness effect in existential sentences depends in part on decisions about the class of existential sentences. Probably no one is in doubt about examples such as those in (1):

(1) a. There is a fly in your soup.
b. There are three students waiting to be seen.
c. There are people to see and places to go.

A crucial question here is whether or not examples like those in (2) should be included in this category or regarded as belonging to a different construction:

(2) a. There is the leftover chicken from last night.
b. There are only thee and me (and sometimes I wonder about thee).
c. There is the laundry to be brought in and the dishes to be dried.

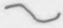
In this paper I want to defend the position that the examples in (2) belong to essentially the same construction as those in (1) (thus supporting the views of, e.g., Bolinger 1977, Barwise and Cooper 1981, Woisetschlaeger 1983, and Lumsden 1988). Hence I will argue that the definiteness effect should not be regarded as a prohibition against (some) definites but rather the fact that (some) existentials with definites require special contextualization. This in turn suggests that the best account of this effect will be in pragmatic, rather than purely syntactic or semantic, terms. Finally, it will be noted that the NPs requiring special contextualization do not coincide with those frequently defined in formal terms as definite (i.e. NPs whose determiner is *the*, a demonstrative, or a possessive, as well as proper names and pronouns). This in turn has consequences for what the formally definite NPs DO have in common.

2. The status of contextualized existentials

Sentences like those in (2) have a couple of well known distinctive characteristics. Pragmatically, they virtually require a context in which a question has been raised about the existence of some entity to fill a certain need or other role. Thus the examples in (2) are natural answers to the questions in (3), respectively.

(3) a. What is there to eat?
b. Are there any sane people in the world?[1]
c. How much work is there left to do?

In view of this property I will henceforth refer to this kind of existential as a 'contextualized existential' (or CE). Secondly (a related fact) -- an example like (2a) may occur with rising (or at any rate non-falling) intonation, as pictured in (2a').



(2a') There's the leftover chicken...

These characteristics have apparently led a number of people, following Milsark (1974:126-7), to regard sentences like (2) as invoking a (possibly incomplete) list. In fact these examples are frequently called 'list' existentials. Furthermore in some analyses of existentials this hypostatization of a list plays a crucial role in accounting for definiteness effects. In the remainder of this section I will argue against such analyses.[2]

2.1. Safir's analysis.

Probably the most extreme example is the analysis in Safir 1985, 1987.[3] Safir regards the superficial similarity of examples such as those in (1) and (2) (e.g. dummy *there* as subject, presence of *be*[4]) as concealing important differences. While the *be* in (1) is predicational, and the *there* simply a dummy; in (2) *be* is asserted to be 'identificational', and the *there* 'stands for some discourse-controlled presupposed heading of the list' (1985:119). Thus the examples in (2) are held to be similar in structure and interpretation to Safir's example (4) (1985:119):

(4) The starting five are Bob, Carol, Alice, Ted and Lenin.

---

[1] Larry Horn reminds me that the exact quote I am alluding to here is: 'All the world is queer save thee and me, and even thou art a little queer', attributed to Robert Owen on separating from his business partner William Allen, in 1828.

[2] Lakoff (1987:561f) has asserted a similar view concerning list analyses.

[3] Safir 1987 does not actually discuss CEs, but the analysis of ordinary existentials given there provides a relevant contrast and aspects of it will be cited below.

[4] Discussion of the presumably related construction with dummy *there* as subject but main verb other than *be*, such as

(i) There strode into the room a tall young woman

are beyond the scope of this paper. See Aissen 1975, Bolinger 1977, for some early discussion.

This analysis is inspired by the need to account for Case on the definite NPs in focus position. In ordinary existentials, on Safir's analysis, indefinite NPs receive Case by being bound by *there*, and escape Principle C of the Binding Theory by not being considered R-expressions. In fact they are considered to be predicate nominals.

There are a number of problems for Safir's analysis.[5] Although it is claimed to 'account plausibly for the semantics of the list interpretation' (ibid.), it is not clear how this is so. Note for instance that replacing *be* in examples like (2) with *consists of* or *includes* is not possible preserving either sense or grammaticality. Then too it is not possible to reverse the supposed arguments of *be*, in contrast to the case with ordinary identification statements. Compare the examples in (5) and (6) below:

(5) a. The starting five are Bob, Carol, Alice, Ted and Lenin.
b. Bob, Carol, Alice, Ted and Lenin are the starting five.

(6) a. There is the leftover chicken from last night.
b. The leftover chicken from last night is there.

There in (6b) has only the locational reading -- i.e. (6b) does not mean the same thing as (6a). In reply it might be pointed out that proforms in identificational sentences frequently cannot occur in object position. Thus the example in (7a) below, with demonstrative *that*, is not reversible.

(7) a. That is Mary.
b. *Mary is that.

However note that *there* in its demonstrative function can appear in object position in an identificational sentence, as in (8b):

(8) a. There is where the forks go.
b. Where the forks go is there.

Another problem for Safir's analysis is explaining why *there* should have this particular pronominal type of interpretation only in sentences like those in (2). Corresponding to (5a) we can have something like (9a), but this type of use is not possible with *there*, as (9b) shows:

---

[5] See also Heim 1987 for a discussion of the problem presented by what Carlson 1977 calls 'amount relatives', such as example (i):

(i) What light there is in this painting is quite diffuse.

I am grateful to Greg Stump for reminding me of this.

(9) a. The starting five/they are (listed) on the blackboard.
b.*There is (listed) on the blackboard.

(We must imagine (9b) as a response to, e.g., *What is there on special today?*, in order to provide the 'discourse controlled presupposed heading of the list'. It doesn't help.)

Finally, Lumsden (1988:133) notes that the relatively high degree of referentiality of a number of indefinites in ordinary existentials, such as (10):[6]

(10) There was this weird guy in the bookstore this morning.

weakens the grounds for claiming a distinction between ordinary existentials and CEs on the grounds of referentiality. On Safir's analysis *this weird guy* in (10) is a predicate nominal, but that does not seem to be right. Note on the one hand that it cannot occur as a complement of *seem* (one of Safir's diagnostics for predicate nominals (cf. 1987:86)):

(11) a. John seems a fool.
b.*John seems Mary's brother.
c.*John seems this weird guy.

And on the other hand it can occur with apparently the same sense and reference it has in (10) in ordinary argument positions:

(12) a. This weird guy came up to me in the bookstore this morning.
b. I saw this weird guy hanging around the bookstore this morning.

(See also the examples of ordinary existentials with definite NPs given below in section 3.) Safir's analysis is open to other objections aimed generally at hypostatization of a list which will be discussed below in section 2.3.

2.2. Rando and Napoli's analysis.

Rando and Napoli (1978) also invoke a list as an essential part of their account of the definiteness effect. On their theory (1) and (2) do belong to basically the same type of construction, and both assert existence. The difference lies in what is being asserted to exist, and in (2) 'what is predicated as existing is the entire list'[7] rather than the items on it. Their explanation for the definiteness effect itself involves not definiteness but anaphoricity -- the focus NP in an existential must be nonanaphoric, in some sense. More specifically, they characterize anaphoric NPs as those whose referents are 'previously mentioned or otherwise known to both speaker and hearer' (p. 307). This is intended to capture the intuition that the focus NP introduces new information.

---

[6] Prince 1981 argues that NPs like *this weird guy* in (10) are indefinite but necessarily specific. I use this kind of example because it brings out Lumsden's point especially clearly. The same point could have been made with an ordinary indefinite like *a very weird guy*, the difference is that the latter may have a nonspecific, nonreferential interpretation in some contexts, while *this weird guy* cannot.

Rando and Napoli's analysis is an appealing one, but it too is not without problems. Note first that the relevant notion of anaphoricity needs revision in the light of examples like (13), which would be strained even in a context in which the speaker does not assume the addressee knows of her brother:

(13) ?There's my brother in the living room.

Apparently the degree of accommodation such examples call for (cf. Stalnaker 1974, Lewis 1979) is not sufficient for assertion. A more serious problem for Rando and Napoli is that it is not true that the focus NP in an existential, whether or not it is construed as introducing a list of some kind, can never be anaphoric. The examples below show this:

(14) A: Who should greet the guests?
B: Well, there's John.
A: Yes, I suppose there's always him.

(15) A: Don't forget that Kim will be bringing a salad.
B: Oh right -- there is that.

The focus NPs in the existentials in these examples are clearly anaphoric in the relevant sense, and the notion of a list will not be helpful here. Rando and Napoli say that 'for a list to be non-anaphoric, some aspect of it must be unknown -- must be new information, e.g. the choice of members or the number of members' (p. 311). But neither the choice of referent nor its cardinality is new information in either (14) or (15), and nothing else seems to be new either.

Rando and Napoli were apparently strongly influenced toward their 'list' analysis by the distinctive nonfalling intonation contour of a typical utterance of (2a), which they describe as 'the intonation of a list' (p. 300). However this is not, in fact, ordinary list intonation (which is a simple rise) but rather a pattern called 'fall-rise' (or FR) by Ward and Hirschberg 1985 (following Ladd 1980).[8] Note the following examples, in which \ / marks the same FR pattern. ((16) is Ward and Hirschberg's (6), and (17) is their (85).)

---

[7] (P. 306) Actually Rando and Napoli attribute this assertion to Milsark 1974, 1977, but they do accept it as being 'essentially correct' (p. 307). Furthermore I do not believe Milsark ever said exactly this. Milsark's view will be touched on below.

[8] I am grateful to Craige Roberts for pointing this out to me in comments following the oral presentation of this paper. Ward and Hirschberg cite a number of other discussions of this contour (1985:749), which they also refer to in later work (Ward and Hirschberg 1989) as 'L*+H L H%', following Pierrehumbert 1980.

(16) A: How can anyone with any sense not like San Francisco?
B: \Bill/ doesn't like it.

(17) A: Can you sing a Motels song right now?
B: Now?
A: Yeah.
B: My \cou/sin can.

On Ward and Hirschberg's analysis examples like those in (16A) and (17A) invoke an open predicate, where potential satisfiers of this predicate form a scale (analyzed by Ward and Hirschberg as a partially ordered set (or poset)). It seems clear that CEs like (2a) function to suggest items to fulfill certain roles, which seems at least consistent with the Ward and Hirschberg analysis.[9] Ward and Hirschberg argue that the intonation pattern itself conveys a conventional implicature of uncertainty, or a lack of speaker commitment. The lack of completion this contour conveys could be the result of anticipation by the speaker of some kind of judgment on the part of the addressee as to whether the suggestion is a good one or adequate for the job at hand. Of course it could be maintained that this in turn implies a hypothetical list of some kind -- namely a list consisting of other suggestions if the current one is not acceptable. This might correspond to Ward and Hirschberg's scale, and may, in fact, be the source of Milsark's original intuition that there is a list 'lurking in the background' (see below). However even if that were true, there would be no reason to incorporate such a list into the truth conditions of examples like (16B) or B's second utterance in (17). As Ward and Hirschberg note, that utterance 'is true if and only if it is true that B's cousin "can sing a Motels song right now"' (p. 773). By the same token I claim it has no place in the truth conditional semantics of examples like those in (2). And note finally that (2a) need not be uttered with the FR intonation pattern. It might, in the same context, have a sharp fall indicating a sudden inspiration. In that case both the hesitancy, and the implication of other satisfiers for the need at hand, would not be present.

2.3. General arguments against the 'list' hypostasis.

Above we have looked at two fairly specific versions of the view that CEs introduce or make reference to a list of some kind, and seen that there are problems with each of them. These two are not the only analyses that invoke a list for CEs,[10] although they are among the most explicit. I have two arguments aimed generally at analyses that invoke a list for CEs.

---

[9] I am a bit hesitant about the need to postulate a scale in these cases.

My first argument is really a challenge -- how exactly is the list to be incorporated into the semantic interpretation of such sentences? I take it as uncontroversial that a verbal list is not in question here. We would need something more abstract. In another sense a list could be construed as a sequence of items, but there is no evidence that ordering is part of the interpretation of examples like those in (2). Thus the the truth conditions seem unaffected by changes in ordering; (2b) (repeated here) expresses the same proposition as (2b').

(2) b. There are only thee and me.
b'. There are only me and thee.

Furthermore one can explicitly deny the relevance of order, as in (2c'), below.

(2) c'. There is the laundry to be brought in and the dishes to be dried, but not necessarily in that order.

We seem to be left with a mereological sum or (equivalently here, I think) a set. Milsark 1974 suggests this route, using the examples in (18) (his (97)-(99)):

(18) a. Is there anything worth seeing around here? Well, there's the Necco factory.
b. Well, there are all those potholes on Main Street.
c. Well, there are many of my favorite eyesores.

> One could imagine that in such cases some principle allows the class predicate EXIST to take not the set denoted by the (quantified) NP as its argument, but rather a hypothetical set which is projected from the NP by taking the set actually denoted by NP as a member. This larger set would be the 'list' which seems to be lurking in the background of the interpretation of sentences such as [(18)]. (p. 127)

Passing over issues to do with the nature of the denotation of the focus NP itself, this sketch still leaves unanswered the question of the determination of the hypothetical set which is to be 'projected from the NP'. One possible answer in the case of (18a) would be that the larger set is the singleton which contains the denotation of the NP. However this set is completely determined by the NP, and thus equally definite. On the other hand if the hypothetical set is required to contain at least one additional member, then there arises the question of how the additional member is to be determined. Presumably the discourse context would come into play here -- so that in example (18) the additional items would be things to see. However this suggestion would run into problems with examples like (19), which explicitly assert that there are no additional items of the requested type.

---

[10] Ziv 1982 is one example, although she indicates some hesitancy (p. 77). Belletti (1988:15) is more enthusiastic.

(19) A: Is there anything left to do?
B: There is only the wrapping and mailing -- that's all.

Alternatively one might try to propose some kind of intensional entity -- for (18) something like the sense of the phrase *things to see around here*. However that move would seem to have trouble getting the truth conditions of sentences like (18) correct. (Presumably abstract things like intensions exist independently of which particulars happen to fall into their extensions at any given time or place. Thus there may be things to see in Cambridge even after the Necco factory is torn down.) There may be other possible ways to incorporate a list into the semantics of CEs, but the burden of pursuing them is clearly on the person who wants to claim that this is the right approach to take. The only reason I can see for doing so is to try to maintain the view that definites are excluded from existentials in the face of clear counterexamples.

My final argument against lists is that the invocation of a list does not adequately distinguish CEs from ordinary existentials. (This may seem odd from one who wants to argue that the construction is essentially the same. My point is going to be that the construction is syntactically, semantically, and functionally essentially the same. It is clear that there are differences, but I want to try to explain those differences in pragmatic terms.) Observe first that we can have what seem to be quite ordinary existentials where a list of NPs is in focus, e.g. (20).

(20) There are three carrot sticks, some broccoli, and a fly in your soup.

Note that an example like (20) does not require any special contextualization -- i.e. it could begin a discourse. (A suitable next utterance might be *Are you sure you followed the recipe exactly?*) If (20) is, despite this, regarded as also invoking a list in the same sense that the examples in (2) are so regarded, then it needs to be explained how (20) is different from (1a):

(1) a. There is a fly in your soup.

It is not a possible response to say that in (1a) there is only a single NP in focus, since that is also true of (2a). By the same token the list analysis does not explain the other distinctive property of CEs noted above, namely the fact that they typically require special contextualization. As just noted, (20) could begin a discourse. One can even have an ordinary existential which explicitly introduces a list at the beginning of a discourse. Compare (21):

(21) Hi -- there's a list of possible things for dinner posted on the fridge. I'll be home about 9:00. See you later.

The examples in (2), on the other hand, do not seem suitable for discourse openers. An adequate account of CEs and the definiteness effect should give an explanation for this.

3. The 'unified' view.

Of those analyses which regard CEs like (2) as different syntactically and/or semantically from ordinary existentials like those in (1), probably the majority invoke a list in some way.[11] In the preceding section we have seen a number of arguments against such approaches. I want to turn now to a 'unified' view of existentials. This is the view that CEs and ordinary existentials belong to a single construction type and have the same kind of semantic interpretation. This approach has immediate plausibility in view of the fact that the examples in (1) and (2) are quite parallel in surface form (although see note 16, below). Note too that CEs like (2) typically provide answers to questions which have been couched with ordinary existentials, such as those in (3). It is also the case that both kinds of sentences seem to function typically to present items to the addressee, and an existence asserting analysis of their meaning seems apropos in both cases. This approach also has the methodological edge of Occam's Razor.

To complete this happy picture we need to provide an explanation for the fact that CEs typically cannot be felicitously used to initiate a discourse. This follows almost immediately from two facts. One is that the focus in such examples is an NP whose denotation is explicitly presumed to be familiar to the addressee. The other fact is that, given this, it should be anomalous simply to assert the existence of such an entity. However it is not anomalous if the existence of this entity is pointed out as a response to a request for entities to fulfill a certain role, or a request for entities of a certain type.[12] In such a context to assert the existence of something which is assumed to be known to the addressee becomes a polite way to suggest that entity as suitable for the purposes at hand. It is polite because it is indirect -- as Lumsden notes (1988, p. 224) both (22b) and (22c) are possible answers to the question in (22a):

---

[11] There are other possibilities, of course. Some (Heim 1987, Higginbotham 1987, Enç 1991) simply do not mention CEs. Keenan 1987 seems to ignore them for the most part, but does assert that (on his analysis, and correctly) existentials which have a focus NP with a definite determiner do not have an 'existence assertion' reading. Thus he states that (ia) below has only the reading of (ib) and not (ic) (p. 304).

(i) a. There were most of the students at the party.
    b. Most of the students were at the party.
    c. Most of the students at the party existed.

However this is not true. (ia) can have the reading of (ic) as a response to a question like (ii).

(ii) How many people were there at the pep talk following the party?

On the other hand it is not clear to me that (ia) can have the interpretation of (ib) at all.

(22) a. What could I give my sister for her birthday?
b. John's book on birdwatching.
c. There's John's book on birdwatching.

However, Lumsden argues, while (22b) asserts (23), (22c) only implicates it:

(23) You could give your sister John's book on birdwatching.

Lumsden points out that the implicature is cancellable with (22c), but the assertion of (22b) is not cancellable:[13]

(24) a. What could I give my sister for her birthday?
b. ?John's book on birdwatching, but I'm not suggesting it's a suitable present.
c. There's John's book on birdwatching, but I'm not suggesting it's a suitable present.

Note too the apparent need for politeness here. As noted above, use of the anaphoric definite implies the speaker is assuming the addressee is familiar with the referent. Hence in this kind of context, that is in the face of a request by the addressee for entities for some purpose, it must be supposed that the addressee has either forgotten about the existence of this entity, or hasn't considered it as a possibility for the purpose at hand. The existential construction allows the speaker to make a suggestion without preempting the addressee's right to make their own judgment as to its suitability.

I need to acknowledge at this point that the explanation offered here has an element of the *post hoc* about it. One could ask why it should be considered polite to assert the existence of an entity that you are in the same breath acknowledging your addressee's familiarity with. It is not inconceivable that to do this should, on occasion or in some possible world, be construed as rude. Hence I wouldn't want to predict that this kind of sentence is universally usable in this way. Nevertheless it seems clear that in present day English examples like (22c) are in fact more polite than ones like (22b), and the account offered above provides at least a partial explanation of that fact.[14]

---

[12] Again I want to stress that a number of people have already asserted essentially this view, e.g. Bolinger 1977, Barwise and Cooper 1981, Woisetschlaeger 1983, Lakoff 1987 and Lumsden 1988. (I should note that I did not become aware of the excellent discussion in Lumsden 1988 until quite recently, after the main content of this paper was already formulated.)

[13] I have changed Lumsden's examples slightly. See his discussion, pp. 215-25.

It has been suggested that CEs are subject to some other peculiar restrictions in addition to those noted already. Rando and Napoli cite Hankamer 1973 as claiming that CEs do not allow future or perfect tenses, or negation, but give the examples below in reply (n. 14, p. 311).

(25) Q: What will be there be to see in London?
A: There'll be the Tower of London, St. Paul's, and much more.
(26) Q: What families have ruled England?
A: There have been the Plantegenets, the Tudors, and the Stuarts.
(27) Q: What is there to see around here?
A: ?Well, there isn't the Washington Monument anymore -- that was swept away in the flood.

Note too that the account supported here predicts that negative, as well as interrogative, CEs should be odd (note Rando and Napoli's question mark for (27A)). It ought to be odd to deny or question the existence of something whose existence you are explicitly presupposing. On the other hand when negative questions are used as tentative positive assertions, we would expect the naturalness which we find in an example like (28), for which I thank Bill Ladusaw.

(28) Isn't there the leftover chicken from last night?

Finally Geoff Nunberg contributed the examples in (29):

(29) a. Is there the IRS to worry about?
b. Too bad there isn't Dick Nixon to kick around anymore.

Given what I just said about predicting badness for negative and interrogative CEs, these examples need an explanation which I do not have at present. It may be that the infinitival complement is, in effect, what makes these o.k.

At this point I would like to summarize the view defended above before turning to a consideration of the nature of definiteness. The view defended here starts with the assumption (shared by many) that existential sentences are interpreted as assertions of existence.[15] The definiteness effect, reinterpreted here as a requirement of special contextualization for NPs which indicate that the speaker assumes the addressee is familiar with their denotation, is held to be a pragmatic consequence of this interpretation. Thus the distinctive properties of CEs are explained with a minimum of arbitrary stipulation or unmotivated apparatus.[16] We saw above that one attempt to give an account of the definiteness effect syntactically -- in terms of Case marking -- suffered from a number of unsolved problems. We saw also that the Milsark/Rando and Napoli semantic account was problematic. I have not shown that no purely syntactic or semantic analysis of existentials and the definiteness effect can succeed, but the prospects for such an eventuality do not look bright.[17]

---

[14] In the discussion following the talk questions were raised about the possibility of CEs in other languages. It was reported to me that these are fine in Dutch, but there seemed to be some doubt about their possibility in German and French (but cf the remarks by Rando and Napoli (1978:312)). This issue requires further investigation.

[15] Craige Roberts and Alessandro Zucchi both stressed to me in comments following this talk that existentials cannot be held to assert ordinary, real world existence. This issue is discussed at greater length in Abbott 1991.

4. Definiteness.

We turn now to a brief consideration of the nature of definiteness. Definite NPs are typically defined formally to include (in addition to personal pronouns and proper names) NPs whose determiner is *the*, a possessive NP, or a demonstrative. As is well known, there have been traditionally two major competing conceptions of what this group of NPs have in common. Christopherson 1939 argued that the essence of definiteness was familiarity, and Heim 1982 incorporated this theory into her file change semantics. Russell's analysis of definite descriptions imposed instead a condition of uniqueness (which differentiates them from indefinites). This view was supported by Hawkins, who argued however (on the basis of definite plurals and mass NPs) that the essence was inclusiveness rather than uniqueness: '...reference must be to the totality of objects or mass...' (1978:160). Hawkins' 'inclusiveness' could be taken as the natural extension of 'uniqueness' to masses and plurals. Given a group, in general there is only one unique subgroup (that is, there is only one which is uniquely determined by just the descriptive material in a CNP whose extension is the group), and that is the one which is equal to the whole. This inclusiveness or uniqueness must be relativized to the context in some way. Hawkins' speaks of a 'shared set of objects' -- that is, shared by speaker and addressee.[18]

---

[16] In this context it should be pointed out that there are two other distinctive properties of CEs which require an explanation. The first is the fact that whereas ordinary existentials may include a predicating phrase in addition to the focus NP, CEs are definitely constrained in this regard. Thus in the ordinary existential in (ia) the PP is a separate constituent, but the PP in (ib) must be construed as part of the focussed NP.

(i) a. There's a book on the table.
b. There's the book on the table.

((ib) is heard naturally as an answer to a question like *What can we use to prop open the window*") In Abbott 1991 I attempt to account for this property in pragmatic terms.

The other property is the greater ability of CEs to lack number agreement with the focus NP. Thus compare the examples in (ii) and (iii):

(ii) a. There are three apples on the table.
b. $^{?}$There's three apples on the table.
c. *There is three apples on the table.

(iii) A: Is there anything to eat?
B: There are the apples we bought yesterday.
B': There's the apples we bought yesterday.
B": $^{?}$There is the apples we bought yesterday.

I am grateful to Arnold Zwicky for pointing this phenomenon out to me. Unfortunately I do not have an explanation for it at present.

[17] See Abbott 1991 for more extensive arguments in favor of a pragmatic view and against syntactic and semantic accounts.

Given the view of existentials supported here, and the assumption that the definiteness effect is appropriately named, we would expect to find support for the familiarity theory. That is, ordinary existentials should exclude definites because of their presumed familiarity (or accommodatability, as noted above in connection with (13)). Any occurrence of a definite in focus position should introduce the requirement of special contextualization, because of the anomaly of asserting the existence of something marked as familiar to the addressee. However this is not the case.[19] At least some cataphoric definites ('where what follows the head noun, rather than what precedes it, enables us to pinpoint the reference uniquely' (Quirk, et al. 1985:268)) can occur in ordinary existentials. One clear example is the following, from Enç 1991 (attributed to David Pesetsky):

(30) There are the following counterexamples to Streck's theory...

NPs like that focussed in (30) provide support for the uniqueness/inclusiveness view of definiteness and against the familiarity view.[20] (30) itself suggests that the crucial factor as far as existential sentences go is (as Prince 1992 notes) not definiteness but familiarity. Note that such cases must be distinguished from cases frequently described as involving accommodation such as example (13) above. (30) should also be distinguished from a number of examples of formally definite NPs occurring in ordinary existentials such as the following:

---

[18] See Wilson 1991 for arguments that the uniqueness property as described here cannot be extended to all uses of definite descriptions, and that we must recognize a 'pronominal' use as a distinct type of reading. It is nevertheless true that the reference of definites is fixed, even on the pronominal use, in contrast to the use of indefinites.

[19] This point is made by Prince (1992), who says 'In point of fact, There-sentences do not require indefinite NPs at all; rather, they require Hearer-new NPs' (p. 9). I would modify this claim in a couple of ways. First, of course, I would restrict it to ordinary There-sentences. But in addition the assertion that these NPs 'evoke an entity that is Hearer-new' (p. 10) needs at least some discussion in the light of examples such as those in (30) below (which are similar to examples cited by Prince). See below, where it is suggested (following Woisetschlaeger 1983 and Lumsden 1988) that the 'hearer-new' entity in question is an instance of a kind of thing.

[20] See also the discussion in Kadmon 1990.

(31) a. There weren't the funds necessary for the project. [Bolinger 1977]
b. There was never that problem in America. [Rando and Napoli 1978]
c. There was the usual crowd at the beach last Sunday. [Prince 1981]
d. There was the smell of pot all over the apartment. [Woisetschlaeger 1983]
e. There were the same people at both conferences. [Prince 1992]
f. There is always the possibility that they'll be late.

Any of these (like (30)) could be used to begin a discourse (possibly with irrelevant modifications). Hence they must be classified as ordinary existentials rather than CEs. However for at least some of these examples it does not seem to be true that the focus NP denotes something unfamiliar to the addressee. Indeed, in (31b) *that problem* clearly refers deictically to a problem under discussion; in (31c) the phrase *the usual crowd* seems to entail that the entity denoted is in fact familiar to the addressee; and (31d) seems to assume familiarity with the smell of pot. The best explanation for these examples seems to be along the lines proposed in Woisetschlaeger 1983, and elaborated in Lumsden 1988. That is that the definite NPs in (30) denote kinds of things, in some sense, and what is being introduced are instances of those kinds. It remains to be seen how such an approach, if correct, is best formalized.

References

Abbott, Barbara. 1991. A pragmatic account of the definiteness effect in existential sentences, ms, East Lansing, MI: Michigan State University.

Aissen, Judith. 1975. Presentational-there insertion: A root cyclic transformation. CLS 11.1-14.

Barwise, Jon & Robin Cooper. 1981. Generalized quantifiers and natural language. L&P 4.159-220.

Belletti, Adriana. 1988. The case of unaccusatives. LI 19.1-35.

Bolinger, Dwight. 1977. Meaning and form. New York/London: Longman.

Carlson, Greg. 1977. Amount relatives. Lg. 53.520-542.

Christopherson, Paul. 1939. The articles: A study of their theory and use in English. Copenhagen: Munksgaard.

Enç, Murvet. 1991. The semantics of specificity. LI 22.1-25.

Hankamer, Jorge. 1973. *There*-Insertion and the definiteness of deletion targets. Paper presented at the 4th meeting of the New England Linguistic Society, Brown University.

Hawkins, John. 1978. Definiteness and indefiniteness: A study in reference and grammaticality prediction. London: Croom Helm.

Heim, Irene. 1982. The semantics of definite and indefinite noun phrases. University of Massachusetts, Amherst dissertation.

Heim, Irene. 1987. Where does the definiteness restriction apply? Evidence from the definiteness of variables. Reuland and ter Meulen, eds., 21-42.

Higginbotham, James. 1987. Indefiniteness and predication. Reuland and ter Meulen, eds., 43-70.

Kadmon, Nirit. 1990. Uniqueness. L&P 13.273-324.

Keenan, E. L. 1987. A semantic definition of 'indefinite NP'. Reuland and ter Meulen, eds., 286-317.

Kuno, Susumo. 1971. The position of locatives in existential sentences. LI 2.333-378.

Ladd, D. Robert. 1980. The structure of intonational meaning. Bloomington: Indiana University Press.

Lakoff, George. 1987. Women, fire, and dangerous things: What categories reveal about the mind. Chicago: University of Chicago Press.

Lewis, David. 1979. Scorekeeping in a language game. Journal of Philosophical Logic 8.339-59.

Lumsden, Michael. 1988. Existential sentences: Their structure and meaning. London: Croom Helm.

Milsark, Gary Lee. 1974. Existential sentences in English. MIT dissertation. (Page references are to the I.U.L.C. edition, 1976.)

Milsark, Gary Lee. 1977. Toward an explanation of certain peculiarities of the existential construction in English. Linguistic Analysis 3:1-29.

Pierrehumbert, Janet B. 1980. The phonology and phonetics of English intonation. MIT dissertation.

Prince, Ellen F. 1981. On the inferencing of indefinite-*this* NPs. Elements of discourse understanding, ed. by A.K. Joshi, B.L. Webber, and I.A. Sag, 231-250. Cambridge: Cambridge University Press.

Prince, Ellen F. 1992. The ZPG letter: Subjects, definiteness, and information-status. Discourse description: Diverse linguistic analyses of a fund raising text., ed. by Sandra A. Thompson and William C. Mann. Philadelphia/Amsterdam: John Benjamins. (Page references are to a ms.)

Russell, Bertrand. 1905. On denoting. Mind 14:479-93.

Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech, and Jan Svartvik. 1985. A comprehensive grammar of the English language. London: Longman.

Rando, Emily and Donna Jo Napoli. 1978. Definites in *there*-sentences. Lg. 54.300-13.

Reuland, Eric J. and Alice G.B. ter Meulen. 1987. The representation of (in)definiteness. Cambridge, Massachusetts: MIT Press.

Safir, Kenneth J. 1985. Syntactic chains. Cambridge University Press.

Safir, Kenneth J. 1987. What explains the definiteness effect? Reuland and ter Meulen, eds., 71-97.

Stalnaker, Robert C. 1974. Pragmatic presuppositions. Semantics and Philosophy, ed. by Milton Munitz and Peter Unger, 197-214. New York: New York University Press.

Ward, Gregory and Julia Hirschberg. 1985. Implicating uncertainty. Lg. 61.747-776.

Ward, Gregory and Julia Hirschberg. 1989. Intonation and propositional attitude: The pragmatics of L*+H L H%. ESCOL '88, 512-522.

Wilson, George M. 1991. Pronominal descriptions. Journal of Philosophy 88.359-87.

Woisetschlaeger, E. 1983. On the question of definiteness in 'An Old Man's Book'. LI 14.137-54.

Ziv, Yael. 1982. Another look at definites in existentials. Journal of Linguistics 18.73-88.

Linguistics & Languages
Michigan State University
East Lansing, MI 48824-1027
abbott@msu.edu

Strong and Weak Novelty and Familiarity

Cleo Condoravdi
CSLI, Stanford University

1 Introduction

In the novelty/familiarity theory of indefinite and definite NP's that Heim (1982) develops, there is a one-to-one correspondence between the definiteness of an NP and the felicity conditions it is associated with.[1] Two types of felicity conditions are associated with definite and indefinite NP's, an index condition and a descriptive content condition, and taken together they provide necessary and sufficient conditions for definiteness and indefiniteness.

In this paper I will argue that the felicity conditions associated with definites and indefinites vary both within a language and cross-linguistically. I will propose that the variation observed can be captured by distinguishing between strong and weak novelty and strong and weak familiarity. Strong novelty, corresponding to Heim's novelty, is construed as association with novelty conditions for the index and the descriptive content. Weak novelty is construed as association with a novelty condition for the index. Strong familiarity, corresponding to Heim's familiarity, is construed as association with familiarity conditions for the index and the descriptive content. Weak familiarity is construed as association with a familiarity condition for the descriptive content.

The evidence for the distinction between strong and weak novelty comes from two sources: (*i*) the existence of indefinite NP's which may presuppose their descriptive content, (*ii*) the existence of indefinite NP's which require the non-entailment of their descriptive content. Bare plurals in English exemplify the former type, and singular indefinites the latter. Similarly, the evidence for the distinction between strong and weak familiarity comes from two sources: (*i*) the existence of definite NP's which may be associated with a novel index, (*ii*) the existence of definite NP's which require that their index be familiar. Greek definite plurals exemplify the former type, and English definites the latter.

2 The Functional Reading of Bare Plurals

In this section I will establish that English bare plurals exhibit a universal reading which arises both with individual-level and stage-level predicates and cannot be straightforwardly attributed to the presence of a quantifier. The reading is tied to a presupposition of existence of a special kind and arises in contexts which entail existence of that sort. I call this reading 'the functional reading' since, as will be shown in section 4, a contextually salient function is implicated in its analysis.

---

[1] Thanks to Tony Davis, Donka Farkas, Mark Gawron, Bill Ladusaw, Louise McNally, Chris Piñón and Sandro Zucchi for very useful discussions and for their comments on oral presentations or previous versions of the paper.

2.1 The Indefiniteness Analysis of Bare Plurals

In the analysis of bare plurals as indefinite NP's, proposed by Krifka (1987) and Wilkinson (1988) and based on the treatment of indefinites in Kamp (1981) and Heim (1982), one type of genericity is reduced to the presence of an appropriate operator. The bifurcation in the readings of bare plurals noted by Carlson (1977) is a property shared by all indefinite NP's. The generic reading of singular and plural indefinites is a quantificational reading, arising when their corresponding variable is bound by a generic operator. The plural indefinite in (1a) and the singular indefinite in (1b) are analyzed as contributing a variable in the restriction of the implicit generic operator G, as in (2a). In (1c), on the other hand, there is no operator and the indefinite is caught by existential closure, as in (2b).

(1) a. Whales are mammals.
b. A whale is a mammal.
c. Whales are roaming the coast.

(2) a. $(G_x\text{: } whale(x))\ mammal(x)$
b. $\exists_x\ (whale(x)\ \&\ roam\text{-}the\text{-}coast(x))$

The generic operator, as argued by Krifka (1987, 1988, 1990), has two properties that will play a role in the discussion to follow: it is adverbial and it has a modal dimension. Since the determination of the modal dimension is heavily context dependent the multiple ambiguity that we detect with generic adverbial quantifiers can be explained away if we take into account the context dependency of their modal base and ordering source (Kratzer 1981; Heim 1982). The modal dimension of the generic operator also accounts for Dahl's (1975) observation that indefinite NP's are associated with a non-accidental generalization reading, under the assumption that an implicit generic operator is present, for example, in (3a) and (3b) but not in (3c).

(3) a. A member of this club does not drink whisky.
b. Members of this club do not drink whisky.
c. The members of this club do not drink whisky.

In what follows, I will adopt the analysis of bare plurals as indefinites but will show that besides their expected existential and generic readings bare plurals also have a reading in which they neither assert existence nor are bound by a quantifier.

2.2 Functional Reading with Individual-Level Predicates

A prediction of the standard indefiniteness analysis is that the universal reading of bare plurals arises only in quantificational contexts. A universal reading, however, arises in a wider range of contexts than those that can be uncontroversially assumed to be quantificational.[2] Consider (4a) and three possible continuations, (4b) – (4d), and note that (4b) appears synonymous with (4c), not (4d). (4b), unlike (4d), does not make an existential assertion and like (4c) it seems to presuppose the existence of students in the actual world.

(4) a. In 1985 there was a ghost haunting the campus.
b. Students were aware of this fact/the danger.
c. The students were aware of this fact/the danger.
d. There were students who were aware of this fact/the danger.

That the bare plural in (4b) lacks an existential reading is not surprising given that the predicate is individual-level. But is the universal reading due to the presence of an implicit generic operator? If there is such an operator, then it must be distinct from the one commonly assumed to be present in standard cases of generic quantification. To begin with, there is no non-trivial modal dimension to the operator: (4b) expresses an actual and, moreover, accidental generalization.

We might say that the operator is associated with a totally realistic modal base and a trivial ordering source,[3] and that there are additional contextual restrictions limiting the domain of quantification to the students on the campus in 1985 during the ghost's appearance. On that analysis, (4b) would involve the quantificational structure in (5a) and it would end up expressing an actual generalization because the modal base would be determined by the context to be totally realistic and the ordering source trivial.

(5) a. $(G_x : \mathit{student}(x)\ \&\ \mathit{CR}(x))\ \mathit{be\text{-}aware}(x,p)$[4]
b. (4b) is true in w relative to a totally realistic modal base R_w and a trivial ordering source $\leq_w$ iff for every x such that $\mathit{student}(x)\ \&$ $\mathrm{CR}(x)$ is true in w $\mathit{be\text{-}aware}(x,p)$ is also true in w.

---

[2] A more accurate description of the reading would be 'quasi-universal' given that exceptions do not suffice to render the generalization expressed false. In what follows, the term 'universal' is to be understood with this caveat.

[3] A totally realistic modal base is one which contains only the actual world, *i.e.*, for all w_1, $w_1 \in R_w$ iff $w_1 = w$. A trivial ordering source is such that $w_1 \leq w$ for any w_1 and w.

[4] CR is a cover designation for the additional contextual restrictions. For the sake of concreteness, I have given the predicate *be aware* a proposition as its second argument but will not be concerned here with how the content of the propositional argument is construed.

Such an analysis, quite apart from raising the question of whether we can in general use the implicit generic operator with a totally realistic modal base and a trivial ordering source to make non-generic universal statements, would not be sufficient as there remain two major problems. First, in exactly the same context as that of (4b), the singular indefinite has only an existential reading (consider (6)), hence the operator must somehow be prohibited from binding a variable contributed by a singular indefinite.

(6) a. In 1985 there was a ghost haunting the campus.
b. A student was aware of the danger.

Second, not any contextual restriction is possible. Specifically, there are contexts which provide extra information that could in principle constitute a further restriction on the domain of quantification but cannot be added to the restriction of the implicit operator. (7d) still expresses the same generalization as (4b) in the context of (7a) and (7b), not the more contextually restricted one corresponding to 'every student in this dormitory'. The overt nominal quantifier in (7c), on the other hand, accepts the extra contextual restriction.

(7) a. There is a ghost haunting the campus.
b. There are 500 students in this dormitory.
c. Every student is aware of the danger.
d. Students are aware of the danger.

Similarly, in a deictic context, like that of (8), the bare plural receives the same reading as (4b), not the more contextually restricted one picking out the perceptually salient students.

(8) Context: We know that there is a ghost haunting the campus. We are standing in front of the library and we can both see several students.

Students are afraid to enter the library.

Moreover, Krifka (1987) has argued on the basis of examples like (9) that nominal quantifiers are easily amenable to contextual restrictions (consider (9b)) while adverbial quantifiers and the implicit generic operator are not, at least with respect to individuals (consider (9c) and (9d)).

(9) a. (Out of the blue:) Every lion has a mane. (non-restricted)
b. There are lions and tigers in the cage. Every lion has a mane. (restricted or non-restricted)
c. There are lions and tigers in the cage. A lion always has a mane. (non-restricted only)

d. There are lions and tigers in the cage. A lion has a mane. (non-restricted only)

Now, if the operator responsible for the universal reading of the bare plural in (4b) must accept contextual restrictions, it follows that (10b), as opposed to (10a) or (9d), must be ambiguous between a non-restricted and a restricted reading. The non-restricted reading would be due to the regular implicit generic operator, the restricted reading to the newly postulated implicit operator. However, only the non-restricted reading is available for both (10a) and (10b).

(10) a. There are lions and tigers in the cage. Lions always have a mane.

b. There are lions and tigers in the cage. Lions have a mane.

To summarize so far: if we assume the presence of an operator, (*i*) we must explain why it cannot bind the singular indefinite, (*ii*) we must spell out the conditions for admissible contextual restrictions on the domain of quantification.

2.3 Functional Reading with Contextually Restricted Adverbials

Bare plurals can co-occur with certain contextually restricted proportional adverbs of quantification which presuppose the existence of the group forming the basis of the proportion and whose atomic parts they quantify over. The interaction of bare plurals with such adverbs demonstrates that the constraints on the selection of appropriate contextual restrictions are not determined entirely by the quantifier but depend on the indefinite NP as well. Therefore, even if we assimilated the special implicit operator to these adverbs, we would still have to account for the selective affinity of bare plurals with plural definite NP's.

The bare plural in (11b), like the plural definite in (11c) and in contrast to the singular indefinite in (11d) or the plural indefinite in (11e), is compatible with contextually restricted proportional adverbs of quantification. The only possible reading for (11d) and (11e) is one in which *mostly/for the most part* are predicate modifiers specifying the degree of awareness.[5] Such a reading is excluded in (11f) because of the syntactic position of the adverb, hence (11f) is unconditionally unacceptable.

(11) a. There is a ghost haunting the campus.

b. Students are mostly/for the most part aware of the danger.

c. The students are mostly/for the most part aware of the danger.

d. (#) A student is mostly/for the most part aware of the danger.

---

[5] The (#) notation is meant to indicate that the sentences are unacceptable on the quantificational reading for the adverbial and acceptable on the predicate modifier reading.

BEST COPY AVAILABLE

e. (#) Some students are mostly/for the most part aware of the danger.

f. # A student/Some students for the most part is/are aware of the danger.

g. The students/Students for the most part are aware of the danger.

The pattern in (11) shows that the distribution and interpretation of the adverbials is not just a matter of the plurality of the accompanying NP, nor a matter of definiteness alone. The crucial factor for the felicity of (11b) and (11c) is whether the previous context entails the existence of a group of students which is to form the basis of the proportion for the adverbial quantifier. If (12) is the LF representation for (11b) and (11c), *students*(X) and $CR(X)$ constitute presupposed information in the restriction of the quantifier.[6]

(12) $(\mathit{Mostly}_x : x \leq_{at} X \;\&\; \mathit{students}(X) \;\&\; CR(X))\ \mathit{be\text{-}aware}(x, p)$

The question is what kind of information should be entailed for the definite NP and for the bare plural NP and what kinds of contexts entail it. In contexts mirroring those of (7), (8) and (10) contextual restrictions for the bare plural are again impossible. Consider (13), where only the non-contextually restricted reading is possible for the bare plural – giving rise to falsity, in fact – while the contextually restricted reading is present for the definite NP.

(13) a. There are lions and tigers in this cage.

b. The lions are mostly/for the most part old.

c. Lions are mostly/for the most part old.

In short, if we were to assume that the non-generic implicit operator is a proportional adverb of quantification, we could account for its incompatibility with the singular indefinite but we would still have to specify what the right entailments of existence are and which contexts give rise to them.

2.4 Functional Reading in Quantified Contexts

The universal reading of bare plurals arises in overtly quantified contexts as well and the presupposition of existence shows the expected presupposition projection effects.

2.4.1 Adverbs of Quantification: Dependent Reading

Consider (14). If we analyze (14b) as in (15a), then the variable bound by the adverb of quantification must pick out the maximal collection of students in each case, otherwise we would run into the proportion problem. For example, if there have been four such appearances of a ghost, and during one of them the number of students happened to exceed the number of students of the other three occasions taken together, then according to (15a) (14b) should be true, whereas intuitively (14b) is judged to be false. Alternatively, if we quantify over situations, as in (15b), the situations must be individuated in such a way as to contain the maximal collection of students in each case. Or, if we assume that an implicit operator is also present, as in (15c) and (15d), we must ensure that it has narrow scope w.r.t. the adverb of quantification. Note that (15c) gives us the wrong reading for (14b).[7]

---

[6] That these are presupposed, as opposed to simply introduced in the restriction of the quantifier, can be seen by the behavior of the plural indefinite *some students*.

(14) a. Ghosts have occasionally haunted this campus.
b. Students were usually aware of the danger.

(15) a. $(\mathit{Usually}_x : \mathit{student}(x)\ \&\ \mathit{be\text{-}on\text{-}campus}\ (x))\ \mathit{be\text{-}aware}(x,p)$
b. $(\mathit{Usually}_s : s : \exists_{y,s}(\mathit{ghost}(y)\ \&\ \mathit{be\text{-}on\text{-}campus}(y,s)\ \&\ \mathit{student}(x)\ \&\ \mathit{be\text{-}on\text{-}campus}(x,s)))\ \mathit{be\text{-}aware}(x,p)$
c. $(G''_x : \mathit{student}(x)\ \&\ \mathit{be\text{-}on\text{-}campus}(x))((\mathit{Usually}_s : s : \exists_y(\mathit{ghost}(y)\ \&\ \mathit{be\text{-}on\text{-}campus}(y,s)))\ \mathit{be\text{-}aware}(x,p))$
d. $(\mathit{Usually}_s : s : \exists_y(\mathit{ghost}(y)\ \&\ \mathit{be\text{-}on\text{-}campus}(y,s)))((G''_x : \mathit{student}(x)\ \&\ \mathit{be\text{-}on\text{-}campus}(x,s))\ \mathit{be\text{-}aware}(x,p))$

The effect that bare plurals have on the individuation of the domain of quantification shows that they can impose certain requirements on the context w.r.t. which they are evaluated. This is, in fact, what we would expect if the conclusion reached in section 2.3 is on the right track and if we have a sufficiently fine-grained conception of context.

2.4.2 Projection of the Existential Presupposition

In the consequent of a conditional, the singular indefinite may have an existential reading, as in (16b). In the same position, the bare plural in (16a) has only the universal reading. Moreover, (16a), but not (16b), seems to presuppose that there are students with connections in the police department in all campuses in the domain of quantification. This must be because of the existential presupposition associated with the bare plural.

(16) a. Usually, if a ghost is present on a campus, students with police connections are aware of the danger.
b. Usually, if a ghost is present on a campus, a student with police connections is aware of the danger.

---

[7] According to (15c), every student on the campus is such that he/she was aware of most appearances of a ghost.

Let us first see that the existential presupposition associated with the bare plural on its special reading is projected in the usual fashion in conditional sentences. Indeed, (17a) and (17b) as a whole presuppose that there are students with connections in the police department.[8]

(17) a. If students with connections in the police department are aware of the danger, they will inform the rest.

b. If a ghost is present on the campus, students with police connections are aware of the danger.

Assuming the account of presupposition projection proposed by Karttunen (1974) and Heim (1983), the existential presupposition associated with the bare plural in the consequent of (16a) affects the domain of quantification as follows. Given that the presuppositions of the consequent must be entailed by the previous context augmented by the local context provided by the antecedent, the existence of students with connections in the police department must be entailed for each choice of campus and occasion of a ghost's presence on a campus. Therefore, we assume either that there are no campuses without students with police connections, or if such campuses exist, that they are not in the domain of quantification.

2.5 Functional Reading with Stage-Level Predicates

The universal reading of bare plurals also shows up with stage-level predicates, in purely episodic contexts. The sentences in (18) are ambiguous: on one reading, they are synonymous with the corresponding ones in (19), on the other, they are understood as involving the totality of the entities specified by the NP. On the latter reading, for example, (18a) is a statement about all (relevant) linguistic theories and (18b) is a promise about all (relevant) details.

(18) a. Linguistic theories have posited abstract representations.

b. Details will be presented tomorrow.

(19) a. There are linguistic theories that have posited abstract representations.

b. There are details that will be presented tomorrow.

Similarly, (20) can be understood either as an existential statement about some opponents and proponents of the approval, or as a statement involving the totality of the opponents and proponents of the approval. Moreover, the totality effect associated with the second reading is independent of the kind of predication involved. Both readings allow for a distibutive or a collective predication.

---

[8] The conditionals in (17) are meant to be one-case conditionals, so the implicit necessity operator (assumed to be present in all conditionals) is to be taken as having an epistemic modal base. Also, in (17b) the presupposition is inherited by the whole conditional under the assumption that the presence of a ghost makes no difference one way or another with respect to the existence of students with police connections on the campus.

(20) Although the odds still seem to favor Senate approval of Thomas, *opponents* redoubled their effort and tried to delay a floor vote on confirmation ... *Proponents*, in contrast, demanded a vote next week.
(*San Francisco Chronicle*, Sept. 28, 1991)

That the universal reading is present in purely episodic contexts is surprising and problematic for all existing theories of bare plurals and the individual/stage-level contrast. Let us consider, for instance, the theory of Kratzer (1989) and Diesing (1990). On that theory, if a predicate is stage-level, it contains a davidsonian variable, and in order for an indefinite not to receive an existential reading it would have to be outside the domain of existential closure. More concretely, (21a) is the LF representation corresponding to the structure in which the indefinite has remained within the domain of existential closure; depending on the predicate, we can have a distributive or a collective reading. (21b) and (21c) are the LF representations corresponding to the structure in which the indefinite has moved outside the domain of existential closure.

(21) a. $(\textit{before-now}(l)\ \&\ \exists_X\ (\textit{proponents}(X)\ \&\ \textit{demand-vote}(X, l))$
(distributive and collective reading)

b. $(G''_x : \textit{proponent}(x)\ \&\ \textit{before-now}(l))\ \exists_{l'}\ (l' \leq l\ \&\ \textit{demand-vote}(x, l'))$

(distributive reading)

c. $\textit{before-now}(l)\ \&\ \textit{proponents}(X)\ \&\ \exists\ (\textit{demand-vote}(X, l))$
(uninterpretable)

An indefinite outside the domain of existential closure must be bound by an operator; otherwise, the sentence would be uninterpretable since indefinites cannot be given a value by the context of use.[9] Let us, in fact, assume that there is an operator with all the provisions needed to cover the problems discussed earlier.[10] An operator, as in (21b), would give us the universal reading but it would, in addition, force a distributive reading. Thus, an analysis along the lines of Kratzer and Diesing predicts that the existential reading occurs with either a distributive or a collective predication while the universal reading occurs only with a distributive predication. However, both (20) and (22), which contains a purely collective predicate, can be interpreted as involving a single group and a single eventuality.[11]

---

[9] In the system of Heim (1982) in Chapter II, operator indexing makes reference to indefiniteness, there is text-level existential closure and the context of use is assumed to supply a value for any free variable (since only definites may end up as free variables). In the system of Kratzer (1989), by contrast, operators bind all free variables in their restriction, there is no text-level existential closure and, as a consequence, free variables must be discriminated as to whether they correspond to indefinites or not.

[10] For cases with no iterative reading we would, in addition, have to ensure that the operator binds only the variable of the indefinite and not the davidsonian variable. See the previous footnote for why this is a problem.

(22) Proponents met to discuss their strategy.

The crucial observation is that the universal reading is systematically related to a presupposition of existence.[12] It is not a consequence of some pragmatic conversational implicatures. For example, (23) does not acquire a universal reading in a context in which I utter it while looking outside the window, having every reason to believe that all the dogs I can see are all the dogs tearing up my backyard, and in which the hearer is aware of that fact.

(23) Dogs are tearing up my back yard.

Nor is the universal reading an artifact of the interpretation of determinerless NP's since when the bare plural receives an existential interpretation and there is an assertion of existence, there is no totality effect present.

2.6 Overview

The issues raised by the facts we have considered so far are as follows.

[1] If a contextually restricted implicit operator is responsible for the universal reading of the bare plural in (4b), then the contextual restrictions cannot be supplied simply by the context of utterance. This was shown by the excluded readings of (7d), (8), (10b), (13c), and by the fact that in certain quantified contexts the implicit operator must have narrow scope w.r.t. another operator, like the adverb of quantification *usually* in (14).

[2] How can we characterize the presupposition of existence that is present? This is a problem we have to address regardless of whether we give an operator analysis for the bare plurals in (4b), (7d), (8), (14b) or not since the existential presupposition also has the effects witnessed in (11), (16a), (17), (18), (20), (22).

[3] If there is no operator, how is the bare plural interpreted?

[4] If we analyze the bare plural as a plain indefinite, then how does it differ from the singular indefinite or other plural indefinites ((6), (11d–f), (16b)) and why does it appear to be in free variation with the corresponding definite in certain contexts ((4c), (11c))? The definite in (4c) and (11c) must be felicitous by virtue of accommodation. But if both a definite and an indefinite NP are

---

[11] A similar argument can be made with respect to individual-level collective predicates.

[12] In Diesing's theory, while it is true that an indefinite presupposes existence iff it undergoes QR, there is no way to interpret QR'ed indefinites not bound by an operator.

acceptable in precisely the same context and with the same semantic effect what does that indicate about their respective felicity conditions?

[5] On the other hand, we do not want the bare plural to be a disguised definite description of the usual sort either. Again (7d), (8), (10b) and (13c) constitute evidence against such an approach. If we analyzed those instances of bare plurals as disguised definite descriptions, we would run into the same problem we did assuming an implicit operator; on the operator analysis we have to answer the question what kinds of contextual restrictions are acceptable, on the disguised definite description analysis the question what kinds of antecedents are acceptable. We are, however, better off with respect to quantificational contexts[13] and the presupposition projection effects.

I will strike a balance by analyzing bare plurals as indefinite descriptions which always require a novel index but which can be felicitous in a wider range of contexts than standard indefinites. The universal reading which is associated with a presupposition of existence arises when the bare plural is evaluated w.r.t. a context entailing its descriptive content, in a sense to be made precise. I will cast the analysis within the file change theory of Heim (1982) but in order to allow for the possibility of indefinites which are felicitous w.r.t. contexts entailing their descriptive content certain revisions will have to be made.

3 The Novelty/Familiarity Theory of Definite and Indefinite NP's

In the file change theory, which underlies Heim's novelty/familiarity analysis of definites and indefinites, the interpretation of a given element is provided by specifying its file change potential. The file change potential is a function, possibly partial, from files to files. Files model semantic contexts and are construed as pairs consisting of a set of natural numbers, the domain of the file Dom(F), and a set of assignment function possible world pairs, the satisfaction set of the file Sat(F). The felicity conditions an element may be associated with specify the conditions under which the function from files to files is defined. The felicity conditions associated with definite and indefinite NP's are covered by the Extended-Novelty-Familiarity-Condition (Heim 1982, 369–70).

(24) EXTENDED-NOVELTY-FAMILIARITY-CONDITION:
For ϕ to be felicitous w.r.t. a file F, for every NP_i in ϕ it must be the case that:
a. if NP_i is [−def], then $i \notin Dom(F)$;
b. if NP_i is [+def], then $i \in Dom(F)$ and if NP_i is a formula, F entails NP_i.

An NP is [+def] iff (a) its index is in the domain of the file, (b) its descriptive content is entailed by the file. The familiarity of the descriptive content condition captures the intuition that definites presuppose their descriptive content. The two conditions jointly imply that in order for NP_i to be felicitous w.r.t. context F then $i \in \mathrm{Dom}(F)$ and, for all $\langle a_N, w\rangle \in \mathrm{Sat}(F)$, a_i is N in *w* (taking N to correspond to the common noun predicate of the NP).

---

[13] Like narrow-scope definites, bare plurals would be getting a dependent reading. See Heim (1982) for discussion of narrow-scope definites.

An NP is [–def] iff (a) its index is not in the domain of the file, (b) its descriptive content is not entailed by the file. The novelty of the descriptive content condition captures the intuition that indefinites assert their descriptive content. The two conditions jointly imply that in order for NP_i to be felicitous w.r.t. context F then $i \notin \mathrm{Dom}(F)$ and there is some $\langle a_N, w\rangle \in \mathrm{Sat}(F)$ such that a_i is not N in *w*.[14]

There is, however, no necessary logical connection between the index condition and the descriptive content condition.[15] In Heim's system, the descriptive content condition for novelty is a consequence of the index condition by Condition B, a stipulated general condition on files, while for familiarity, the familiarity of the index follows from the descriptive content condition given Condition B.[16] Condition B ensures that a file does not cross-reference to non-existent discourse referents:[17] sequences in the satisfaction set of a file must agree exactly on the indices already in the domain of the file and can vary everywhere else. Formally, it is stated as in (25) (Heim 1982, 304).

(25) CONDITION B:
For every file F, for every $n \notin \mathrm{Dom}(F)$: if a_N and b_N are two sequences that are alike except insofar as $a_n \neq b_n$, then $a_N \in \mathrm{Sat}_w(F)$ iff $b_N \in \mathrm{Sat}_w(F)$, for all worlds *w*.

With Condition B Heim gets the novelty of the descriptive content of an indefinite NP for free, given the novelty of its index, and can tie together the felicity conditions for the index and the descriptive content of a definite NP so that the relevant assignment functions assign the right kind of entity to the right index, namely the index corresponding to the referential index of the NP is assigned to an entity of which the predicate of the NP holds.

The intuitions captured this way are the following two equivalences: (a) an NP asserts existence iff it introduces a new discourse referent, (b) an NP presupposes existence iff it is anaphoric on an already existing discourse referent. The evidence from the behavior of bare plurals discussed in section 2 argues that we must allow for NP's which presuppose existence but introduce a new discourse referent. Empirically, therefore, the biconditional in (a) fails in the leftward direction – if an NP introduces a new discourse referent, it is not necessarily the case that it asserts existence[18] – and the biconditional in (b) fails in the rightward direction – if an NP presupposes existence, then it is not necessarily the case that it is anaphoric.[19] At a somewhat more technical level, Condition B imposes the following restriction: no conditions involving individuals can be placed on worlds in the common ground except through discourse referents. This restriction we now have reason to reexamine, and are therefore forced to abandon Condition B.

---

[14] This is actually not strong enough, as it would allow for a context in which all words contain individuals which are N; it could be strengthened so as not to depend on the assignment for the index of the NP, along the lines of fn.15. In any case, as we will see shortly, Heim does not need to specify a felicity condition requiring the non-entailment of descriptive content for indefinite NP's because of a general constraint she imposes on files.

[15] In principle, a file can entail, for example, that there is something that is a cat without having a fixed assignment for the index of the NP. Given that a file F entails a formula ϕ iff $\mathrm{Sat}(F) \subseteq \mathrm{Sat}(F+\phi)$, a file F would entail the open formula '*x* is a cat' iff for every $\langle a_N, w\rangle \in \mathrm{Sat}(F)$ there is some *j* such that a_j is a cat in *w*.

[16] This is actually true only for NP's with non-trivial descriptive content.

[17] Discourse referents correspond formally to indices in the domain.

If we allow for NP's to be associated with a single felicity condition, however, we can no longer express the entailment or non-entailment of the descriptive content of an NP in terms of F entailing or not entailing the NP (more accurately, a formula reconstructible from the NP). But then what exactly should a file entail for a given NP? As I will show in the next section, we have to appeal to the notion of a file entailing another file.

4 Weak Novelty

I propose that bare plurals are indefinites which are associated only with an index felicity condition. Consequently, they are felicitous both w.r.t. files that do not entail their descriptive content and w.r.t. files that do. In the former case, bare plurals have the range of interpretations standard indefinites do, in the latter, they acquire the special universal reading. Files of the latter type are restricted to come about only under certain circumstances.

Let (26a) and (26b) be the LF representations of (4a) and (4b), respectively, and F the file obtained after the utterance of (4a).

(26) a. $\mathit{ghost}(x_m)$ & $\mathit{campus}(x_j)$ & $\mathit{haunt}(x_m, x_j, x_l)$ & $\mathit{in\text{-}1985}(x_l)$

b. $\mathit{student}(x_i)$ & $\mathit{be\text{-}aware}(x_i, p)$

Given that it is part of general background knowledge that campuses have students, we can assume the existence of a function $f^{student}$ which assigns to each campus in the universe of discourse the maximal collection of students in that campus, as in (27).[20]

(27) $f^{student}$: $\{x\colon\ x$ is a campus$\} \rightarrow \{Y\colon\ Y$ is the maximal collection of students on $x\}$

---

[18] In other words, it does not assert existence w.r.t. all (felicitous) contexts.

[19] It is not anaphoric w.r.t. to all (felicitous) contexts.

[20] Contextually salient functions have been invoked for the analysis of pronouns (Cooper 1979, Engdahl 1986, Heim 1990, Chierchia 1992, *inter alia*) and indefinite NP's with the modifier *certain* (Hintikka 1986).

Given the existence of such a function, the file obtained after the utterance of (4a) may be incremented as in (28), whereby its domain remains unchanged and its satisfaction set is changed to include pairs whose worlds are such that some individual is the value $f^{student}$ assigns to the campus of (4a).[21]

(28) $\mathrm{Dom}(F_1) = \mathrm{Dom}(F)$
$\mathrm{Sat}(F_1) = \{\langle a_N, w\rangle \in \mathrm{Sat}(F)\text{: } \exists\, k\text{: } k \notin \mathrm{Dom}(F) \text{ and } a_k = f^{student}(a_j) \text{ in } w\}$

With this move we have ensured that F_1 contains the information, not contained in F, that some individual satisfies the descriptive content of the NP ***students*** for all worlds in the common ground. However, F_1 does not entail ***student***(x_i) if $i \notin \mathrm{Dom}(F_1)$ since the assignment to *i* can be anything whatsoever.

If bare plurals require that their index be novel but can be felicitous with respect to contexts entailing their descriptive content, then the incrementation in (29), from F_1 to $F_2 = F_1+(26b)$, can be defined, as long as $i \notin \mathrm{Dom}(F_1)$.

(29) $\mathrm{Dom}(F_2) = \mathrm{Dom}(F_1) \cup \{i\}$
$\mathrm{Sat}(F_2) = \{\langle a_N, w\rangle \in \mathrm{Sat}(F_1)\text{: } a_i = f^{student}(a_j) \text{ and } a_i \text{ is aware of the danger in } w\}$

In a context entailing existence, the individuals to satisfy the uttered sentence have to be found amongst those whose existence has been established that way. The effect of the assertion of the indefinite is to fix the assignment for *i*, i.e., to introduce a new discourse referent. The novelty of the index accounts for why we do not get anaphoric readings with bare plurals, as shown by (7d), (8), (10b) and (13c).[22]

Note that we need to appeal to the existence of a salient function relating campuses and the maximal collections of their students for the interpretation of the definite in (4c). What we can informally characterize as the 'accommodation of the definite', amounts formally to the incrementation from F to F_1 seen in (30).[23]

---

[21] Conditions on worlds have to be formulated in terms of assignment functions but this does not mean that we are introducing discourse referents through the back door since we are not fixing the assignment for any particular index.

[22] The novelty of the index excludes presupposed coreference. If it so happens that the dormitory in (7) turns out to contain all the students on campus we will have accidental coreference. To exclude presupposed coreference and hence the anaphoric reading it suffices that some world in the common ground contains some individual that satisfies the descriptive content of the NP and is distinct from those individuals given as the value for indices in the domain and satisfying the descriptive content of the NP.

[23] The definite as well as the bare plural tolerate exceptions up to a point. I am assuming that there is a certain default structure in the construction of the sets which are the value of $f^{student}$. Individuals are assumed to be in that set only if they are not abnormal w.r.t. what is predicated of them. The operator analysis discussed in section 2 is no better off at accounting for the tolerance to exceptions since the operator needs a trivial modal dimension for independent reasons.

(30) $\mathrm{Dom}(F_1) = \mathrm{Dom}(F) \cup \{i\}$
$\mathrm{Sat}(F_1) = \{\langle a_N, w\rangle \in \mathrm{Sat}(F)\text{: } a_i = f^{student}(a_j)\ \}$

However, not any kind of function can be invoked in the incrementation of (28); if that were the case, there would be another source for the unwanted anaphoric reading in (7d), (8), (10b) and (13c). We must distinguish between saliency in the discourse context or the extralinguistic deictic context, on the one hand, and saliency arising from general background knowledge, on the other. At this point I must stipulate that only saliency of the latter type may give rise to the incrementation of the type seen in (28).[24]

For quantificational contexts, like that of (14), we must assume the existence of functions as in (31) mapping every campus and every occasion in which a ghost haunted that campus to the maximal collection of students in that campus on that occasion. The satisfaction set of the file incremented by (14b) is as in (32).

(31) $f^{student}$: $\{<x,s>$: x is a campus and s a situation in which a ghost haunted $x\} \rightarrow \{Y$: Y is the maximal collection of students on x at $s\}$

(32) $\mathrm{Sat}(F + (14b)) = \{\langle a_N, w\rangle > \in \mathrm{Sat}(F_1)$: for most b_N such that they agree with a_N on the Dom(F) and b_l is a situation s in which there is a ghost on a_j $(=b_j)$ in w and there is c_N such that it agrees with b_N on Dom(F) $\cup \{l\}$ and c_i is the maximal collection of students on a_j in b_l in w it is also the case that c_i is aware of the danger in $w\}$

Now, if bare plurals are felicitous with respect to contexts entailing their descriptive content, then the incrementation of the type exemplified by (28) is always allowed as long as the right conditions of saliency obtain. Hence we do not have to say anything special about why bare plurals exhibit the universal reading both with individual-level predicates and with stage-level predicates. I will leave as an open question what forces the incrementation in the presence of individual-level predicates and where exactly the presupposition of existence resides. A full answer to this question would have to include an analysis of individual-level predicates, a task which is largely independent of my concerns in this paper.

What I have assumed so far is that bare plurals in English differ from run-of-the-mill indefinites in that they impose a weaker requirement on contexts to which they can be felicitously added; they only require that their index be novel with respect to the domain of the file.[25] I propose that indefinites may be distinguished according to whether they are weakly or strongly novel. An indefinite is **WEAKLY NOVEL** iff it is associated with an index felicity condition. An indefinite is **STRONGLY NOVEL** iff it is associated both with an index and a descriptive content condition.[26] The index condition requires that the index not be in the domain of the file. The descriptive content condition states that a file F would be an admissible context for the addition of an indefinite NP if it does not entail the file obtained by incrementing F with the NP (see also Heim 1987, fn. 4).

---

[24] This distinction has a precedent; as reported by Krifka (1990), it governs the choice of definite article in certain dialects of German and in Frisian.

[25] How is maximality guaranteed? So far I have built it directly into the analysis so as to make the formulation of certain things more straightforward. However, I do not believe it

(33) $F_1=F+NP_i$, where NP_i is weakly novel, is defined only if $i \notin Dom(F)$

(34) $F_1=F+NP_i$, where NP_i is strongly novel, is defined only if both (a) and (b) hold:
a. $i \notin Dom(F)$;
b. F does not entail $F+NP_i$ (i.e., there is $\langle a_N, w\rangle \in Sat(F)$ such that for all b_N agreeing with a_N for all $j \in Dom(F)$ $\langle b_N, w\rangle \notin Sat(F+NP_i)$).

The condition in (34b) requires that there be some world in the world set of the file which contains no individuals which satisfy the descriptive content of the NP. Requiring simply the non-entailment of NP_i would be too weak since as we saw w.r.t. (28) F_1 does not entail NP_i but it does entail $F+NP_i$. On the other hand, if F does not entail $F + NP_i$, then it does not entail NP_i either.

Given this characterization for the entailment of the descriptive content of an NP, a weakly novel NP would be strong, in the familiar sense of Milsark (1974), in contexts entailing its descriptive content; this is, in fact, what excludes the universal reading of the bare plural in *there*-sentences. See Heim

---

should be made part of the semantics of the bare plural. For example, here's an alternative, where maximality arises as a by-product. Instead of the function in (27), assume we invoke the function in (a), instead of the incrementation in (28), we have the incrementation in (b), where χ is a choice function (a choice function χ is such that $\chi(A) \in A$, for any nonempty set A), and instead of the incrementation in (29), we have the incrementation in (c). This is the strategy that Gawron, Nerbonne & Peters (1991) and Chierchia (1992) adopt to get maximality for E-type pronouns.

a. $f^{student}$: $\{x: x \text{ is a campus}\} \rightarrow \{Y: Y \text{ is the set of all sets of students on } x\}$

b. $Sat(F_1)=\{\langle a_N, w\rangle \in Sat(F): \exists k: k \notin Dom(F) \text{ and } a_k=\chi(f^{student}(a_j)) \text{ in } w\}$

c. $Sat(F_2)=\{\langle a_N, w\rangle \in Sat(F_1): a_i=\chi(f^{student}(a_j)) \text{ and } a_i \text{ is aware of the danger in } w\}$

Maximality would arise under the assumption that the truth or falsity of what is said should not depend on the choice made for the value of χ, so the appropriate value for χ in this case is one that picks out the maximal collection of students. There are alternative ways of working this out but I cannot pursue them here.

[26] Can there be NP's with diverging felicity conditions w.r.t. their index and descriptive content? Such NP's are conceivable, at least for certain combinations of felicity conditions (e.g., a condition requiring novelty for the index and one requiring familiarity for the descriptive content); whether they actually exist is an open question.

(1987) for a formulation of weakness and strength applying directly to NP's rather than determiners in the framework of file change semantics.

5 Weak Familiarity

Now that we have relativized indefiniteness and novelty, the question arises whether definiteness and familiarity should be relativized as well and whether this is to be done along similar lines. What I have said so far should lead us to expect that the answer is yes. If an element can have a presupposition of existence without necessarily being anaphoric (that is without being anaphoric with respect to every context), then we would expect to find elements whose descriptive content must be familiar and which are felicitous both in contexts in which their index is familiar and in contexts in which their index is novel. In this section I show that definite plural NP's in Greek are precisely of that type. The crucial contexts in which we can straightforwardly tease apart definites with a novel index and definites with a familiar index are quantificational contexts.[27]

The distribution and interpretation of plural definites and bare plural indefinites in Greek parallels only partly that of their English equivalent. In non-quantificational contexts bare plural indefinite NP's have an existential reading and assert their descriptive content, as in (35a), and definite NP's have an anaphoric reading and pressupose their descriptive content, as in (35b).[28]

(35) a. Falenes trigirizoun stis aktes.
Whales are roaming in-the coasts
'Whales are roaming the coast.'

b. I falenes trigirizoun stis aktes.
the whales are-roaming in-the coasts
'The whales are roaming the coast.'

A striking property of definite plural NP's in Greek is that they can be bound directly by quantifiers. In fact, in environments of standard generic quantification, as in (36), the definite is acceptable, the bare plural indefinite is unacceptable.

(36) a. I falenes ine thilastika.
the whales are mammals
'Whales are mammals.'

b. *Falenes ine thilastika.
whales are mammals
'Whales are mammals.'

---

[27] Already in Heim (1982) narrow-scope, dependent definites are, in effect, bound by a quantifier. The cases presented here constitute non-dependent definites, or if you like definites which are only "modally dependent."

[28] Greek bare plurals are strongly novel. See Condoravdi (1992).

Definite NP's can also be associated with a non-accidental generalization reading, as in (37), which is another indication that they can be bound by the implicit generic quantifier.

(37) Ta meli aftou tou organismou den kapnizoun.
the members this-GEN the-GEN club-GEN not smoke
'The members/Members of this club do not smoke.'

Moreover, as Newton (1979) and Mackridge (1985) have observed, the interpretation of definites depends on the aspectual marking of the verb. Consider the following quotation from Mackridge (1985, 114) with respect to examples like (38a) and (38b): "The perfective (referring as it does more to specific actions than does the imperfective) may distinguish a definite from an indefinite subject... The Greek sentences are distinguished by a difference in aspect, the English by the absence or presence of the definite article." More accurately, the generalization is that if the verb does not exclude an iterative interpretation for the eventuality, as in (38c), there is an ambiguity between the quantificational reading, correlating with a habitual interpretation for the whole sentence, and the anaphoric reading, correlating with an iterative interpretation for the eventuality.

(38) a. I kopeles pethanan noris.
The girls died-PERF. early
'The girls died early.'

b. I kopeles pethenan noris.
The girls died-IMPERF. early
'Girls used to die early.'

c. I kopeles evgenan ekso.
The girls went-IMPERF. out.
'The girls went out (repeatedly).' or 'Girls used to go out.'

What distinguishes (38a) from (38b) is that there is an implicit operator in (38b), signalled by the imperfective aspect on the verb, which binds the definite. In (38a) the definite receives its usual anaphoric reading since this is a regular episodic context. With an iterative interpretation for the imperfectively marked verb we again get the anaphoric reading for the NP since no operator is present.[29]

As a first attempt, we might say (along with Mackridge) that the definiteness marking on the NP is a superficial feature which should not lead us to believe that such NP's are necessarily definite. In this vein, we may assume that in Greek we have two kinds of plural indefinites, an *indefinitely marked* indefinite and a *definitely marked* indefinite, and we can make provisions so that indefinitely marked indefinites are always in the domain of existential closure, say the VP or the focus domain, while definitely marked indefinites are always outside of that domain. This way, however, we cannot have an explanation for why definitely marked indefinites can never have a purely existential reading and for what differentiates definitely marked and indefinitely marked indefinites bound by a quantifier.

---

[29] The exact workings of aspect marking are far from straightforward but we can be sure that genericity or habituality requires imperfective aspect on the verb and that in episodic contexts we can have either the perfective with a completive interpretation or the imperfective with an iterative interpetation.

We are now in a good position, both conceptually and technically, to approach the issue from the opposite direction. That is, we can interpret definiteness in Greek in such a way that definites can be bound directly by quantifiers. From the perspective of the novelty/familiarity theory of definiteness and indefiniteness, this would amount to allowing the index of a definite to be novel so that quantification may work as in Heim's system, while at the same time requiring the familiarity of the descriptive content so as to make the definiteness marking non-arbitrary. The evidence that this is the right approach to take comes from the apparent free variation between definites and indefinites in modal contexts. Consider (39), where both the definite and the indefinite can be bound by the modal *prepi*.

(39) a. Ta pedia me kolitikes arrosties prepi na benoun edo mesa.
The children with infectious diseases must enter-SUBJ here in
'The children/Children with infectious diseases must enter in here.'

b. Pedia me kolitikes arrosties prepi na benoun edo mesa.
Children with infectious diseases must enter-SUBJ here in
'Children with infectious diseases must enter in here.'

While both (39a) and (39b) may express a generalization over potential, not just actual, individuals, (39a) presupposes that all the worlds in the modal base of the deontic modal contain children with infectious diseases, whereas (39b) is neutral on this score.

I propose that definites may be distinguished according to whether they are weakly or strongly familiar and that plural definite NP's in Greek are weakly familiar. A definite is WEAKLY FAMILIAR iff it is associated with a descriptive content condition. A definite is STRONGLY FAMILIAR iff it is associated both with an index and a descriptive content condition. The index condition specifies that the index must be in the domain of the file. The descriptive content condition states that a file F would be an admissible context for the addition of a definite NP only if it entails the file obtained by incrementing F with NP.

(40) $F_1=F+NP_i$, where NP_i is weakly familiar, is defined only if F entails $F+NP_i$ (i.e., for every $<a_N,w>\in Sat(F)$ there is a b_N agreeing with a_N for all $j\in Dom(F)$ such that $<b_N,w>\in Sat(F+NP_i)$).

(41) $F_1=F+NP_i$, where NP_i is strongly familiar, is defined only if both (a) and (b) hold:
a. $i \in Dom(F)$;
b. F entails $F+NP_i$ (i.e., for every $<a_N,w> \in Sat(F)$ there is a b_N agreeing with a_N for all $j \in Dom(F)$ such that $<b_N,w> \in Sat(F + NP_i)$).

If F does not entail $F+NP_i$, then it does not entail NP_i but not vice versa; if $i \in Dom(F)$ and F entails $F+NP_i$, then F entails NP_i.

6 Conclusion

In this paper I have argued for a more fine-grained theory of novelty and familiarity and for not always tying both the index condition and the descriptive content condition to definiteness and indefiniteness, based on evidence that there are indefinites presupposing their descriptive content and definites with a novel index. Indefinite NP's always introduce a new discourse referent and definite NP's always presuppose existence.

The set of admissible contexts for weakly novel NP's properly includes the set of admissible contexts for strongly novel NP's and the set of admissible contexts for weakly familiar NP's properly includes the set of admissible contexts for strongly familiar NP's. Hence weakly novel NP's have the whole range of readings that strongly novel NP's do (plus more) and weakly familiar NP's have the whole range of readings that strongly familiar NP's do (plus more). If all indefinites are at least weakly novel, then the basic property shared by all indefinites must be that they are never anaphoric. If all definites are at least weakly familiar, then the basic property shared by all definites must be that they never assert existence.

References

Carlson, G. 1977. *Reference to Kinds in English*. Doctoral dissertation, University of Massachusetts, Amherst.

Chierchia, G. 1992. Anaphora and Dynamic Binding. *Linguistics and Philosophy* 15:111-183.

Condoravdi, C. 1992. Weakly and Strongly Novel Noun Phrases. *Proceedings of the West Coast Conference in Formal Linguistics*, vol. 11.

Cooper, R. 1979. The Interpretation of Pronouns. *Syntax and Semantics 10*, eds. F. Heny and H. Schnelle, 61–92. Academic Press, New York.

Dahl, Ö. 1975. On Generics. *Formal Semantics of Natural Language*, ed. E. Keenan, 99–111. Cambridge University Press.

Diesing, M. 1990. *The Syntactic Roots of Semantic Partition*. Doctoral dissertation, University of Massachusetts, Amherst.

Engdahl, E. 1986. *Constituent Questions*. Reidel, Dordrecht.

Gawron, M., J. Nerbonne, and S. Peters. 1991. The Absorption Principle and E-Type Anaphora. CSLI Report No. CSLI 91-153 RR-91-12.

Heim, I. 1982. *The Semantics of Definite and Indefinite Noun Phrases.* Doctoral dissertation, University of Massachusetts, Amherst.

Heim, I. 1983. On the Projection Problem for Presuppositions. *Proceedings of the West Coast Conference in Formal Linguistics*, vol. 2, 114–125.

Heim, I. 1987. Where Does the Definiteness Restriction Apply? Evidence from the Definiteness of Variables. *The Representation of (In)definiteness*, eds. E. J. Reuland and A. G. B. ter Meulen, 21–42. MIT Press.

Heim, I. 1990. E-Type Pronouns and Donkey Anaphora. *Linguistics and Philosophy* 13:137–177.

Hintikka, J. 1986. The Semantics of *A Certain*. *Linguistic Inquiry* 17:331–336.

Kamp, H. 1981. A Theory of Truth and Semantic Representation. *Formal Methods in the Study of Language*, eds. J. Groenendijk, T. Janssen, and M. Stokhof, 277–321. Mathematisch Centrum, Amsterdam.

Karttunen, L. 1974. Presupposition and Linguistic Context. *Theoretical* Linguistics 1:181–194.

Kratzer, A. 1981. The Notional Category of Modality. *Words, Worlds and Contexts – New Approaches in Word Semantics*, eds. H.-J. Eikmeyer and H. Rieser, 38–74. Berlin: W. de Gruyter.

Kratzer, A. 1989. Stage-Level and Individual-Level Predicates. Manuscript, University of Massachusetts, Amherst.

Krifka, M. 1987. Syntax and Semantics of Definite and Indefinite Generics. Partly in collaboration with C. Gerstner. Manuscript, Universität Tübingen.

Krifka, M. 1988. The Relational Theory of Genericity. *Genericity in Natural Language*, ed. M. Krifka, 285–312. Seminar für Natürlich-Sprachliche Systeme der Universität Tübingen, SNS-Bericht 88-42.

Krifka, M. 1990. Genericity: An Introduction. Manuscript, University of Texas at Austin.

Mackridge, P. 1987. *The Modern Greek Language*. Oxford University Press.

Milsark, G. 1974. *Existential Sentences in English*, Doctoral dissertation, MIT.

Newton, B. 1979. Scenarios, Modality, and Verbal Aspect in Modern Greek. *Language* 55:139–167.

Wilkinson, K. 1988. Genericity and Indefinite NP's. Manuscript, University of Massachusetts, Amherst.

CSLI, Ventura Hall
Stanford University
Stanford, CA 94305
condorav@csli.stanford.edu

The Singular-Plural Distinction In Hindi Generics*

Veneeta Srivastav Dayal
Rutgers University

I. The Dichotomy in NP Based Genericity

1.1: The Dichotomy in English

Recent work on generics has shown that genericity is not a uniform phenomenon but involves interaction between the semantics of the noun phrase and the tense-aspect system of a language (see Krifka 1992 for a survey and discussion). This paper focuses on the genericity which is tied to the noun phrase. By this I mean NP's which can serve as arguments to true kind predicates such as *extinct*. As noted by Krifka, this diagnostic distinguishes the definite singular NP and the bare plural in English from the indefinite singular NP. While the former are truly kind denoting, the latter is not, as shown by the fact that (1c) has only a taxonomic reading:

(1) a. The dinosaur is extinct.
b. Dinosaurs are extinct.
c. A dinosaur is extinct.

A question that has remained relatively unexplored is the relationship between the two kind denoting terms, i.e. between the definite generic and the bare plural. While there is a considerable degree of overlap between the two, there are also some striking differences (Heny 1972, Lawler 1973, Vendler 1971, Carlson 1977, Krifka 1992 among others).

As noted by Carlson (1977), for example, definite generics do not readily allow for stage-level interpretations. (2a) has only a non-generic definite reading, while (2b) allows for an indefinite reading.

---

* I am grateful for helpful comments to Maria Bittner, Gennaro Chierchia and the audience at the University of Massachusetts, Amherst. All remaining errors and omissions are my own.

(2) a. The lion is roaring.
b. Lions are roaring.

Another fact discussed by Carlson is that the definite generic is less productive than the bare plural. It seems to be restricted to "well-established" kinds as shown by (3) and (4):

(3) a. The coke bottle has a narrow neck.
b. Coke bottles have narrow necks.

(4) a. The green bottle has a narrow neck.
b. Green bottles have narrow necks.

While the variation between the definite NP and the bare plural does not affect genericity in (3) it does affect it in (4). The definite NP in (4a) has only a non-generic definite interpretation while the bare plural in (4b) is easily interpreted as a generic.

Carlson also discusses the fact that a common noun which is too general does not have a definite generic counterpart. Thus (5a), which has a definite generic, is an odd sentence but (5b), which has a bare plural, sounds quite natural:

(5) a. The airport is a busy place.
b. Airports are busy places.

In this paper I will introduce two types of generics in Hindi which show a relationship very similar to that between the definite generic and the bare plural in English. The novel fact about them is that the morphology makes it clear that the difference between the two must be tied to the number feature. In what follows, I hope first of all to establish that the distinction between the two kind denoting terms is the same in Hindi as in English. Second, I wish to explore ways in which the number feature may impact on the interpretations of generic terms.

1.2: The Dichotomy in Hindi

Hindi has bare singular and bare plural NP's which are known to have generic, definite and indefinite readings, as noted by Verma 1966, Porterfield and Srivastav 1988 (henceforth P&S) and Mohanan 1990.[1] The generic use is demonstrated in (6):

(6) a. kuttaa aam jaanvar hai
dog common animal is
"The dog is a common animal."
b. kutte yehãã aam hãĩ
dogs here common are
"Dogs are common here."

The definite use is shown in (7) below:

(7) a. ravi ek laRkii se milaa. laRkii bahut acchii thii
Ravi a girl met. girl very nice was
"Ravi met a girl. The girl was very nice."
b. ravi kuch laRkiyõ se milaa. laRkiyãã bahut acchii thĩĩ
Ravi some girls met. girls very nice were
"Ravi met some girls. The girls were very nice."

Finally,the indefinite use is illustrated in (8):

(8) a. anu kitaab paRh rahii hai
Anu book reading is
"Anu is reading a book/books."
b. anu kitaabẽ paRh rahii hai
Anu books reading is
"Anu is reading books."

My primary concern in this paper is the generic-indefinite variation of bare NP's. A comparison of bare singulars with bare plurals leads us to recognize that the constraints on the availability of indefinite readings for bare singulars and bare plurals are very different. And further that this difference results from the fact that bare singulars and bare plurals denote different types of generics.

---

[1] I am ignoring in this paper the contrastive reading of such NP's, which are affected by intonation and may be related to focus structure. The readings discussed here are available without special stress.

Briefly, I will claim that bare plurals are kind-level terms linked to their instantiations in a given world and hence to stages of such instantiations. The availability of indefinite readings is tied only to syntactic factors like tense and aspect which determine whether evaluation will take into account the individual or its stage.

In contrast, bare singulars are kind-level abstract entities which are not related to actual instantiations. The indefinite reading of bare singulars is available only in specific syntactic contexts or under very special discourse conditions. The difference in the availability of indefinite readings of bare plurals and bare singulars arises from the fact that in the first case only syntactic factors are at play, while in the second case a combination of syntactic and discourse factors are operative.

It is already clear, I think, that Hindi bare singulars pattern with English definite generics, Hindi bare plurals with English bare plurals with respect to the availability of indefinite readings. Since English marks one type with the definite article and leaves the other one bare, definiteness marking presents itself as one obvious area of inquiry but I think this is a red herring. Hindi generics provide a better clue to what may be at the heart of the problem. Since neither the singular nor the plural is overtly marked for definiteness in Hindi, and both are capable of definite interpretation, the distinguishing factor between the two types of genericity clearly cannot have to do with definiteness. The Hindi facts thus indicate that the proper locus of inquiry for distinctions in genericity must be the number feature.

II. Hindi Bare NP's

2.1: An Analysis For Bare Singulars

Let me begin by summarizing the analysis of bare singulars in P&S, which represents a first attempt at reducing the three-way ambiguity displayed in (6)-(8). I will then show why the specifics of their analysis does not extend to Hindi bare plurals. P&S take the bare singular to be ambiguous between the definite and the generic and I will assume the same for purposes of this talk. Let us say, for the sake of convenience, that Hindi has a null determiner, which analogous to English *the* carries uniqueness implications. Its meaning can be captured via the iota operator. In addition, Hindi also allows bare singular NP's which denote kinds, in the terminology of Carlson. This ambiguity accounts for the variation between (6) and (7).[2] It is with the generic-indefinite variation, however, that I am chiefly concerned with here.

P&S note that while the indefinite reading is available when the bare NP is in object position as in (8a), it is not available when the bare NP is in subject position, as in (9) below. The tense being episodic, the only available interpretation is the definite one[3]:

(9) * laRkii khaRii thii
girl standing was
"A girl was standing."

They propose that the basic reading of the bare NP is that of a generic. When the NP is in object position, they argue, it is possible to interpret it as a generic and still get a pseudo-indefinite reading. In (8a), for example, the verb phrase can be treated as the predicate "book-reading", where the bare NP is a kind-level term. If someone egages in the activity of book-reading, however, it follows that there must be a book or books that she is reading. Thus the indefinite reading is inferred. The absence of an indefinite reading in subject position as in (9), they claim, is due to the fact that predicates are sorted with respect to the type of NP they can take as argument. Generic tense takes individual level arguments while episodic tense takes stage level arguments. The grammaticality of (6a) follows from the fact that there is sortal matching between subject and predicate and the ungrammaticality of (9) from the fact that there is a mismatch between a stage-level predicate and a kind-level argument.

---

[2] A question that I will not pursue here is why bare NP's should be ambiguous between a definite and a generic. Ideally, there would be a way of deriving the definite reading from the generic reading since to the best of my knowledge such an ambiguity exists for bare NP's cross-linguistically.

[3] There is an indefinite reading for (9) which is equivalent to "It was a girl who was standing". This I classify with the contrastive readings which I am not concerned with in this paper.

Another agrument for treating the indefinite reading in (8) as deriving from a generic reading is provided by introducing an adverbial and comparing the sentence with a bare NP with a sentence with a regular indefinite:

(10) a. anu pure din machlii pakaRtii rahii
Anu whole day fish kept catching
"Anu kept catching fish the whole day."
b. anu pure din ek machlii pakaRtii rahii
Anu whole day one fish kept catching
"Anu kept catching a fish the whole day."

(10a) leaves it open whether Anu spent the day catching one or more fish but (10b) restricts interpretation to Anu's catching a single fish. This diagnostic, though not discussed by P&S, is familiar from Carlson's work on bare plurals in English and fully supports the view espoused in P&S that there is no independent indefinite reading of the bare singular.

2.2: The Problem with Bare Plurals

While I believe the basic insight in P&S to be right, the analysis faces a serious problem when we try to extend it to bare plurals in Hindi. Consider the plural counterpart of (9) where the verb has episodic tense and the subject is a bare plural:

(11) laRkiyãã khaRii thĩĩ
girls standing were
"Girls were standing."

Under the line of argumentation sketched above, this sentence should be ruled out as a case of sortal mismatch, on a par with (9) but the bare plural is quite grammatical here. In fact, it behaves exactly like the English bare plural in the translation. In Carlson's analysis of English bare plurals this follows from the semantic operation which maps the bare plural, an individual-level entity into the stage-level entities which realize the kind at the given time and location. The explanation for the ungrammaticality of (9), however, hinged on the assumption that such an operation was not available in Hindi.

The problem, then, can be stated in the following way. If we follow the traditional Carlson analysis where kind level terms can type shift into their stage level correlates for Hindi bare plurals in (11) we lose the explanation for the ungrammaticality of (9). If we follow the account for (9) in P&S which suggests that Hindi differs from English in not having type-shifting operations from kinds to stages we make an incorrect prediction with regard to (11). An obvious solution to the problem is to say that the realization relation is universally available with episodic tense but is undefined for singulars. But this, of course, is pure stipulation unless we can find a principled reason for blocking the realization relation from applying to singulars.

It may be worth mentioning here that though I have articulated the problem using terminology from Carlson, the question of why the two generic terms should behave differently with respect to indefinite readings is a general one and remains in theories, such as those stemming from Heim (1982), which deal with the generic-indefinite variation in other ways. In trying to resolve this problem I will use the specifics of Chierchia (1982, 1984). In this theory all predicates are systematically linked to kind-level terms by a nominalization operation. Thus predicates are linked via their predicate intensions to kind-denoting expressions. Stages are treated as values of the objects that instantiate the kind at a given world-time index. A single relation *Re* replaces Carlson's *R* and *R'* which linked kind and object, respectively, to their stages.

2.3: Mass Terms

Chierchia's theory also extends Carslon's analysis of bare plurals to mass terms. Before going any further, then, let me broaden the range of data to include mass terms in Hindi. In

(12) we see that mass and count nouns, all of which may be bare, can occur in predicative positions in Hindi:

(12) a. yeh sonaa hai
"This is gold."
b. moti kuttaa hai
"Moti is a dog"
c. moti aur hiraa kutte hãĩ
"Moti and Hira are dogs."

They can all serve as arguments of kind-level as well as object-level predicates:

(13) a. sonaa aam dhaatu hai
"Gold is a common mineral."
b. kuttaa aam jaanvar hai
"Dog is a common animal."
c. kutte yahãã aam hãĩ
"Dogs are common here."

(14) a. sonaa pilaa hotaa hai
"Gold is yellow."
b. kuttaa bhaunktaa hai
"The dog barks."
c. kutte bhaunktee hãĩ
"Dogs bark."

The difference comes up in stage-level contexts, where the singular does not yield an indefinite interpretation:

(15) a. yehaa sonaa rakhaa hai
"Gold is lying here."
b. kuttaa bhaunk rahaa hai
"The dog is barking."
c. kutte bhaunk rahee hãĩ
"Dogs are barking."

Since mass terms pattern with plurals in allowing for indefinite interpretations with stage-level predicates, the problem raised earlier can be refined and restated in the following way. Since plural and mass nouns allow for indefinite readings but singular nouns do not, we need to investigate why the realization relation is available with episodic tense for the former but is undefined for the latter.

2.4: The Solution

Let us assume the now standard view, proposed first by Link (1983), that there are singular and plural individuals in the domain of discourse and that singular count nouns pick out atomic individuals while plural count nouns pick out plural individuals which have atomic individuals as parts. This division is blurred for mass nouns since they do not have atomic elements. Technically they are plural since they do have parts but at the intuitive level we think of them as unspecified for number simply because they lack the dimension, i.e. the level of atoms, which would make the singular-plural distinction cognitively significant. In order to tackle the problem at hand we simply classify mass terms as plural terms in virtue of the fact that they do have parts, though they do not have atomic individuals as parts.[4] We can then make the straightforward assumption that the number feature on a noun determines whether it will refer to an atomic or a non-atomic individual. In the case of generics we might say that the number feature determines whether the instantiations of the kind-level entity in a given world will be an atomic or a non-atomic individual.

To take concrete examples, the sentences in (12) require *Re* to apply to the generic terms since the tense is episodic. That is, interpretation will need to access the value of *Re(^gold')*, *Re(^dog')* and *Re(^dogs')* respectively. In the case of (12a) and (12c), this yields the mass of gold that instantiates the kind *gold* and the group of dogs that instantiates the kind *dog* at the relevant world-time indices. The indefinite reading picks out the mass of gold in the plate as part of the total mass of gold and the group of dogs barking as part of the group of dogs in the world. In the case of (12b) the number feature specifies that *Re(^dog')* be a singular individual. But the inherent meaning of a kind suggests that there should be more than one instantiation of it at any world-time index. We may assume that *Re(^Dog')* is undefined because the number feature clashes with the presuppositions associated with a kind term.

---

[4] Chierchia's treatment of mass terms is stated as extending Carlson's theory of bare plurals to singular terms. Because English does not use singular count nouns as NP's, he uses the term *singular* to refer to mass terms which are syntactically singular. His treatment, however, maintains the view that mass terms are semantically like plural count nouns in being composed of parts.

A word of clarification about the restriction imposed by number. A kind can, of course, be instantiated by a unique object if there are enough contextual factors narrowing down the domain of discourse. But that, of course, is tantamount to the definite reading, which (12b) has. Recall that for ease of exposition I am assuming an optional null determiner in Hindi, which functions like the iota. This optional null determiner also accounts for the definite readings that (12a) and (12c) have in addition to the indefinite readings.

Before proceeding further, it may be worthwhile to see how (10) and (11) are to be interpreted. Assuming that *^gold'*, *^dog'* and *^dogs'* each is a kind term formed out of predicate intensions denoted by the common noun accounts straightforwardly for (10) since the predicates involved directly take kinds. But in the case of (11) we have a predicate that requires an object level term. If *Re* is not defined for singular terms, the only object level interpretation for the bare singular in (11b) will be provided by iota, yielding the definite reading. That is, it will be a habitual sentence about a specific dog. But clearly this sentence is also generic. The solution to this problem lies in what we take as the locus of genericity here. These are what Krifka (1992) calls characteristic sentences and analyses as involving quantification over situations. Though *iota* will yield a unique dog per situation, since many situations enter into the evaluation of (11b), the excessively strong uniqueness implications will be diluted. Hence the generic flavor of these sentences.

To recap briefly, the approach I have outlined exploits the mismatch between the inherent nature of the generic and the morphological restriction imposed by the number feature to account for the difference between plural and mass terms on the one hand and singular terms on the other with respect to contexts in which stages of kinds are involved. It differentiates between a singular kind-level term which does not have actual instantiations in any given world and mass and plural generics which are kinds systematically linked to actual instantiations.

III. "Indefinite" Readings of Hindi Bare Singulars

3.1: Incorporated Bare Singulars

Recall that Hindi bare NP's in object position are able to yield indefinite readings. So in (8a) there is no specific book that Anu is reading. Recall also that P&S analyse the predicate in this sentence as a complex noun-verb combination. That is, they derive the indefinite reading from the incorporated verb "to book-read".

One robust manifestation of this claim is that there is no restriction of number. (8a), for instance, is quite compatible with Anu reading one or more books. This is in contrast to the use of the bare plural in (8b) where the indefinite interpretation is restricted to at least two books. Since singular terms are generally not used in Hindi to refer to a plurality of objects, it seems implausible to suggest that the number requirement is suspended in just this context. The facts, however, are as expected under an incorportion account.

A second piece of evidence that is relevant here is that the bare singular must be close to the verb in order for the indefinite reading to be available.[5] Consider (13a) which has the canonical word order for ditransitive structures. That is, the indirect object is not next to the verb. The bare singular indirect object here has only a definite reading:

(13) a. anu bacce-ko khilaunaa degii
Anu child-DAT toy will give
"Anu will give toy(s) to the/*a child."

---

[5] It is not clear whether such incorporation takes place in the lexicon or in the syntax but see Mohanan (1990) for pertinent discussion. In either case, an adjacency requirement for incorporation is to be expected.

In contrast, a bare plural indirect object readily allows for an indefinite interpretation:

(13) b. anu baccõ-ko khilone degii
Anu children-DAT toys will give
"Anu will give toys to the children/children."

Under the present approach, the operation mapping kind to stage is defined for plurals. Re(^children'), in this example, picks out the plural individual that instantiates the kind and the indefinite reading denotes some non-atomic part of it. Closeness to the verb is not at issue since the indefinite reading does not arise via incorporation.

Assuming an adjacency requirement for incorporation, in combination with the view that singular kind terms, unlike plural kind terms, are not linked to actual instantiations thus accounts for the contrast noted here with respect to the indefinite readings of bare NP's.

3.2: "Representative Object" Readings

Let us consider next a set of examples with "indefinite" readings for bare singulars that cannot be reduced to incorporation. Consider (14a) from P&S. Here the postposition *-se* after the bare singular makes an incorporation analysis implausible. Yet it has, in addition to a definite reading, also an indefinite reading:

(14) a. anu DaakTar se shaadii karegii
Anu doctor with marriage will do
"Anu will marry a doctor."

Anu could not be marrying the kind *doctor* but some individual who instantiates the kind. How does this fit in with the view that *Re* is not defined for singulars? Clearly, some modification is in order but I do not think the basic idea has to be given up.

A further fact noted by P&S is relevant in understanding what is going on. (14a) has a variant in which an overt indefinite is used, given below in (14b). While (14a) seems to disfavor a continuation like (14c) which has an anaphor referring back to the bare singular, (14b) readily allows it:

(14) b. anu ek DaakTar se shaadii karegii
Anu a doctor with marriage will do
"Anu will marry a doctor."
c. uskaa naam ravii hai
his name Ravi is
"His name is Ravi."

The answer to the puzzle posed by these examples begins to emerge if we try to understand what discourse factors would determine whether (14a) or (14b) should be used. As far as I can tell, (14a) would be used in the following type of context:

(15) Anu's father is a doctor and Anu lives in his shadow.
The speaker is sure that the only type of person she will
marry will be a doctor, since her father is a doctor.

What the context tells us, then, is that the bare NP refers not to any particular individual but to an instantiation who would be representative of the kind. This explains the subtle difference in interpretation between (14a) and (14b) as well as the difference with respect to anaphora. We might say, that only under special circumstances, ***Re*** may be defined for singular kinds resulting in what Krifka (1992) calls "the representative object" reading.

Another fact relevant in this connection is provided by (16), also from P&S. This represents a slight modification of (14a) in that the NP includes the adjectives "tall" and "poor". This modification results, however, in the loss of the indefinite reading:

(16) vo lambe gariib DaakTar se shaadii karegii
she tall poor doctor with marriage will do
"She will marry the/*a tall, poor doctor."

I think this fits in with the view that the bare NP does not have a bona-fide object level interpretation. Since the object is important only to the extent that he represents the kind *doctor*, it is not unexpected that the mention of properties that are not the natural properties of the kind should be at variance with the intended meaning of the utterance.

Before wrapping up this point, let us consider the plural counterparts of (14a) and (16), given in (17a) and (17b). (17a) shows that anaphora to bare plurals is not problematic and (17b) shows that indefinite readings are possible even with modified noun phrases:

(17) a. anu Daaktarõ-se baat kar rahii hai lekin unke naam
mãĩ nahĩĩ jaantii
"Anu is talking with doctors but I don't their names."
b. anu lambe gariib daktarõ-se baat kar rahii hai
"Anu is talking with tall poor doctors."

Finally, it is worth noting that "the representative object" reading is not always available. Thus the bare singular in (18a) has only a definite reading while the bare plural in (18b) has a definite as well as an indefinite reading:

(18) a. pradhaan mantri vidyarthii-se milĩĩ
prime minister student with met
"The prime minister met with the student."
b. pradhaan mantri vidyarthiyõ-se milĩĩ
prime minister students with met
"The prime minister met with students."

While we do not know why "representative object" readings are not always available, the contrast between (18a) and (18b) shows once again that the indefinite readings of bare plurals is not subject to the same constraints as those for bare singulars.

Though I have not presented an account of incorporation in Hindi or of the "representative object" readings, I hope to have shown in this section that there are far stricter constraints on an indefinite reading for a bare singular than for a bare plural. The factors governing the indefinite reading for bare singulars include, in addition to a predicate which allows for such an interpretation, an appropriate discourse context. For bare plurals, the constraints are purely grammatical. Any syntactic context that calls for stages of kinds yields an indefinite reading. This, I am claiming, is because *Re* is normally undefined for singulars but always defined for plural terms.

IV. Further Issues

4.1: Number vs. Definiteness Marking Crosslinguistically

The discussion so far would have made it amply clear, I think, that there is significant similarity between the Hindi bare singular and the English definite generic. In fact, this parallel was noted in P&S, who classified it as a D-generic in terms of Krifka (1988), drawing attention to examples like (19a) and (19b):

(19) a. agar bacce-ka pet bharaa ho, vo aaram se sotaa hai
if child's stomach full be he easily sleeps
"If the child's stomach is full, he sleeps easily."
b. kal caar se nau ke biic mẽ jabbhi cor
yesterday four from nine between whenever thief
ghar me ghusaa pulis-ne use pakaR liyaa
house in entered police him caught.
"Yesterday between four and nine whenever the thief entered the house, the police caught him."

They pointed out that the bare singular, like the English definite generic in the translation, is alright with generic tense but not with episodic tense. They did not, however, offer any explanation for why this should be so. Under the present view, however, there is an explanation for this fact.

(19a) involves quantification over situations. Though *Re(^child')* is undefined, *iota(^child')* is not. A generic interpretation is possible since quantification over situations cancels out the uniqueness normally assoicated with the iota. (19b), on the other hand, is episodic. The contextual parameters being set, there is only one possible individual that can be denoted by *iota(^thief')*. The oddness of the sentence arises from the semantics of the adverb *whenever* which requires several instances of house-breaking and arrest. If there is only one thief he would have to be released each time he was arrested so that he could be arrested and released again, resulting in a pragmatically odd sentence.

Note that, as expected, the plural counterpart of (19b) is not odd. The English translation is again repesentative of the Hindi facts:

(19) c. kal caar se nau ke biic me jabbhi cor
yesterday four from nine between whenever thieves
ghar mẽ ghuse pulis-ne unhe pakaR liyaa
house in entered police them caught.
"Yesterday between four and nine whenever thieves
entered the house, the police caught them."

This is because *Re(^thieves')* yields a plural individual, different non-atomic parts of which can be involved in each instance of house-breaking and arrest.

If I am right in taking number marking to be the critical factor in determining whether a generic will yield indefinite readings, it makes some strong cross-linguistic predictions. Languages like French and Italian have singular and plural generics both of which are marked with a definite determiner. The Italian sentences in (20), however, have the same interpretations as the English and Hindi counterparts:

(20) a. se la pancia del bambino e' piena, lui dorme bene
"If the stomach of the child is full, he sleeps well."
b. Ieri tra 4 e le 9 ogni volta che il ladro e' entrato,
la polizia lo ha arrestato
"Yesterday between four and nine, each time the thief
entered, the police arrested him."
c. Ieri tra 4 e le 9 ogni volta che i ladri sono entrati,
la polizia li ha arrestati
"Yesterday between four and nine, each time the thieves
entered, the police arrested them."

Obviously, the function of the definite determiner in Italian is different from English *the* in not having uniqueness implications. It may be that the Italian definite determiner is simply a theme marker, as has been suggested for French by

Kleiber (1990). What is significant about Italian for the present analysis is that it too shows that it is the singular-plural distinction and not definiteness which impacts on the availability of "indefinite" readings for kind-level terms.

In fact, it is a prediction of the analysis that any language in which there are singular and plural generics will allow for indefinite readings more readily for the plural than for the singular. A language in which the singular generic was bare and allowed for indefinite readings while the plural generic was definite and resisted such readings -- that is, a language that reverses the pattern of English -- is not expected.

4.2: Productivity of Singular and Plural Kinds

So far I have been arguing for the importance of number marking in interpreting kind-level terms in contexts that call for stages. That is, I have been concerned with showing that it is the number restriction on *Re* that makes it undefined when applied to the singular kind. I would now like to explore briefly the possibility that number marking may also account for the observation noted in examples (3)-(5) that the English bare plural is more productive than the English definite generic. I think it would be clear from the preceding discussion that similar observations hold for Hindi and as far as I know this is also the case for Italian and French. So let us rephrase the observation to read that singular kinds are more restricted than plural kinds.

If there is a common nominalization operation that applies to all predicative terms, it is not obvious that there should be any difference in productivity. Now, there are two possible areas where the number marking could impact in the process of mapping predicate into kind, the predicative expression which is the input to nominalization and the kind term which is the output. I assume that a singular predicative expression denotes a property of atoms while the corresponding plural expression denotes a property of sums of the same atoms. The informational content of the two is not significantly different. Thus the impact of number marking on the input expression is unlikely to be critical.

Suppose, however, that number marking impacts on the output of nominalization, singular number forcing the resulting nominalized expression to be also atomic. The nominalization will then have to be of a type that does not preserve a direct link between the kind and the objects that are the basis of kind formation. This could be if the resulting kind expression was the name of the genus. Let us consider what it means to be a genus. The dictionary defines this as a class of like objects or ideas, having several sub classes or species. If the line of reasoning presented here is on the right track, it follows that the nominalization operation will be freely available and singular kind formation will be readily formed out of singulars as long as the resulting expression can belong in a taxonomic hierarchy.

Consider the contrast in (3)-(4) from this perspective. It is true that a priori *the coke bottle* but not *the green bottle* yields a generic interpretation. But take the following situation. You are on a tour of a plant which makes bottles and the tour guide says, "we manufacture three types of bottles at this plant, green, blue and clear. The green bottle is our particular speciality. It has a long neck." I think there is no problem now in a generic interpretation for the singular term. What the discourse does is to set up the appropriate context in which the green bottle can be thought of as a proper subkind of the kind *bottles*.

The degree of acceptability of such terms, then, is a direct function of our ability to access the taxonomic hierarchy of which the term is a subkind. But this is not a fact about our language competence but a fact about our world knowledge. To confirm this, consider the ease with which we accept the singular generic in "The German consumer is very thrifty", where we interpret *the german consumer* as a subkind in the taxonomy of consumers classified by nations. This is the market analyst's taxonomy but in the world we live in we are able to access it very easily. Surely, *the german consumer* as a generic term would be as problematic as *the green bottle* if we lived in a world where international trade was unknown. Similarly, I believe the difficulty of interpreting singular expressions which are too general generically, as in (5a) is not a linguistic fact. Thus it seems to me that the lack of productivity of the singular generic noted in (3) - (5) is not a generalization about its semantics, but about contexts of use.

Put another way, I believe that the only semantic difference between the singular kind and the plural kind is in their relation to objects, the singular kind "denotes the species itself" while the plural kind denotes the "members of the species", to use the words of Jespersen (1927). While their property sets are not very different, in some sense the singular generic is more abstract than the plural generic. Because of this, plural generics can be used as simple generalizations based on sufficiently many object level verifications. The singular generic, on the other hand, can only be used in contexts where the taxonomy in which the kind term belongs is salient. This is what is at the root of the intuition that singular generics are less productive than plural generics.

V. Conclusion

To conclude, then, I have tried to establish that cross-linguistically there is great uniformity in the semantics of true kind denoting NPs. In a language which marks number morphologically, the singular kind does not have stage-level interpretations while the plural does. And the singular seems less productive than the plural. In establishing this uniformity I hope to have identified number marking as crucial in understanding the dichotomy in NP-based genericity, a problem that had remained intractable so far.

References

Carlson, G. 1977. *Reference to Kinds in English.* Ph.D. dissertation, University of Massachusetts, Amherst.

Chierchia, G. 1982. Bare Plurals, Mass Nouns, and Nominalization. *Proceedings of WCCFL I.*

Chierchia, G. 1984. *Topics in the Syntax and Semantics of Infinitives and Gerunds.* Ph.D. dissertation, University of Massachusetts, Amherst.

Heim, I. 1982. *The Semantics of Definite and Indefinite Noun Phrases.* Ph.D. dissertation, University of Massachusetts, Amherst.

Heny, F. 1972. Review of *Meaning and Structure of Language* by Wallace Chafe. *College English* 33.

Jesperson, O. 1927. *A Modern English Grammar.* Heidelberg: Carl Winter's Universitatbuchhandlung.

Kleiber, G. 1990. *L'article LE Generique: La Genericite sur le Mode Massif.* Geneve: Librarie Droz S.A.

Krifka, M. 1988. An Outline of Genericity. In M. Krifka (ed.) *Genericity in Natural Language: Proceedings of the 1988 Tubingen Conference.* Seminar fur Naturlich-sprachliche Systeme der Universitat Tubingen.

Krifka, M. 1992. *Genericity: An Introduction.*

Lawler, J. 1973. Studies in English Generics. *University of Michigan Papers in Linguistics* 1.

Mohanan, T.W. 1990. *Arguments in Hindi.* Ph.D. dissertation, Stanford University.

Porterfield, L. and V. Srivastav. 1988. (In)definiteness in the Absence of Articles: Evidence from Hindi and Indonesian. *Proceedings of WCCFL VII.*

Vendler, Z. 1971. Singular Terms. In D.D. Steinberg and L.A. Jacobovits (eds) *Semantics: An Interdisciplinary Reader in Philosophy, Linguistics and Psychology.* Cambridge University Press.

Verma, M.K. 1966. *The Noun Phrase in Hindi and English.* New Delhi: Motilal.

Department of Linguistics
Rutgers University
18 Seminary Place
New Brunswick, NJ 08903
srivastav@zodiac.rutgers.edu

Adverbial Quantification, Complex Conditionals, and Focus[*]

Kai von Fintel
University of Massachusetts at Amherst

Introduction

So-called donkey-sentences like the one in (1) raise many important issues for the syntax and semantics of natural language quantification.

(1) If a farmer owns a donkey, he often beats it.

The most influential account of donkey sentences was pioneered by David Lewis (1975), Hans Kamp (1981), and Irene Heim (1982). Its main ingredients are: (i) Indefinites are not existential quantifiers as traditional logic maintained; instead they are interpreted as restricted free variables. (ii) These variables can be bound by an "adverb of quantification" (Lewis' term), such as *often* in (1); these adverbs are unselective binders which can bind all free variables in their scope. (iii) The donkey pronouns are also bound by this unselective binder. (iv) *If*-clauses in general serve to supply the domain of such unselective quantifiers.

Our example donkey-sentence (1) will then receive the logical form and the paraphrase in (2).

(2) a. $\text{Often}_{x,y}$ [a farmer(x) $\wedge$ a donkey (y) $\wedge$ x owns y] [x beats y]
b. "Many pairs x,y such that x is a farmer, y is a donkey, and x owns y are such that x beats y".

The literature on adverbial quantification is plentiful and the Lewis-Kamp-Heim account is by no means the last word. The architect of a theory of adverbial quantification has many important decisions to make. Very roughly and recklessly put, at each choice point the theory could go towards more syntax or more semantics/pragmatics. Let me sketch four issues that have been focal points of the theoretical debates. (i) What kind of things are quantified over? Following Lewis (1975), many researchers assume that adverbial quantifiers quantify over tuples of restricted variables. The alternative, initially more intuitive, is to assume quantification over something like situations (events, times, states of affairs, circumstances, conditions, whatever). (ii) What is the nature of indefinite noun phrases? In the Lewis-Kamp-Heim approach they serve to introduce and restrict free variables. A situation-based approach may be compatible with the more conservative view that they are existential quantifiers. (iii) What is the nature of donkey pronouns? In the Lewis-Kamp-Heim approach they are bound variable pronouns dependent on the unselective quantifier. A situation-based approach would have to take recourse to the E-type account which treats donkey pronouns as disguised definite descriptions. (iv) How is the domain of the adverbial quantifier determined? This question doesn't really arise with nominal quantifiers whose common noun directly gives the appropriate domain. With adverbial quantifiers we have what, following Diesing (1990) and Krifka (1992), could be called the problem of "semantic partition". There is more to be said here than the usual assumption that *if*-clauses are designated devices for restricting quantifiers. Things are more complicated: material from the matrix clause can be quantified over, and not all the material in an *if*-clause has to be quantified over (this is known as the "proportion problem"). Researchers have attempted to get at the roots of semantic partition from different angles. There are syntax-based proposals, especially the theory of Molly Diesing (1990) and Angelika Kratzer (1989a). There are pragmatics-based proposals; for example, Berman (1987) seems to go in this direction. And there are focus-based proposals (Rooth 1985, 1989, Krifka 1992, von Fintel 1992a).

---

[*] The title chosen here differs from the much less appropriate title of the abstract submitted to SALT II ("Conditional Restrictors and (Un)Selective Binding"). This paper is a preliminary report on ongoing research which is supposed to culminate in a significant part of my dissertation. Some of this material was presented in an earlier form at WCCFL XI (von Fintel 1992). A much better paper would have resulted if I had had more time to take into account the arguments and proposals of Manfred Krifka's SALT II paper (Krifka 1992), which covers some of the same ground as mine. While engaged in this research, I have enjoyed the inestimable help of Barbara Partee, Angelika Kratzer, Veena Dwivedi, Hotze Rullmann, Paul Portner, and Sue Tunstall. All mistakes are mine.

At this point, we need new considerations and new data to evaluate the performance of the various theories. What kind of new data might there be? Henriëtte de Swart (1992) and Cleo Condoravdi (1992) both discuss types or uses of noun phrases that had not been considered before in the donkey literature. The avenue that I am exploring in current research is to investigate other adverbial clause-types beyond the usual *if/when*-clauses and their interaction with quantification.[1]

In this paper, I will present and analyze data concerning the availability of donkey-anaphora with indefinites in complex conditionals (*unless*, *only if*, *even if*). Throughout, I will hold certain assumptions constant which I lay out in Section 1. Roughly, I adopt Heim's (1990) "semanticky" situation-based approach to adverbial quantification that treats indefinites as existential quantifiers and takes donkey pronouns to be E-type pronouns. Within this framework, I briefly propose a semantics for complex conditionals (Section 2), and sketch an account of why indefinites in complex conditionals are generally not available for donkey-anaphora (Section 3). In the central part of the paper, I then investigate the respective roles of focus and syntactic scoping in the derivation of the domain of adverbial quantifiers. In Section 4, I show how focus can make indefinites in complex conditionals available for donkey-anaphora after all. And finally in Section 5, I explore the respective bragging rights of focus and syntactic scoping.

---

[1] Lycan (1984) and Geis (1985) are the only references that I am aware of that have similar ambitions. On the whole, they do not seem to take into account the formal semantic literature on adverbial quantification.

1. The Framework Assumed

The Lewis-Kamp-Heim account of donkey-sentences sketched in the introduction breaks with tradition in many respects: especially with its new type of unselective binding and the unorthodox view of indefinites as introducers of free variables rather than as existential quantifiers. As mentioned there, a more conservative approach would treat the adverb as quantifying over one variable only: events, times, or situations, states of affairs, circumstances, conditions, whatever we want to call it.[2] Such an account may also rescues the traditional intuition that indefinite noun phrases have existential force. The most sophisticated version of this line of research is represented by Berman (1987) and Heim (1990) who suggest that adverbs of quantification quantify over situations. They adopt the framework of situation semantics developed by Angelika Kratzer (1989b) to handle problems of counterfactual reasoning.[3] There situations are parts of possible worlds and propositions are reconstructed as sets of situations (intuitively, those situations in which the proposition is true).

Modulo the interpretation of the pronouns and some refinements, this gives (1) the logical form in (3).

(3) a. Often$_S$ [$_S$ a farmer owns a donkey] [$_S$ he beats it]
    b. "Many situations in which there is a farmer and there is a donkey that the farmer owns are such that he beats it."

What can we do with the pronouns in the matrix clause? The situation-based approach takes recourse to the theory of pronouns as disguised definite descriptions (Cooper 1979, Evans 1980). Let me be non-committal as to any specific implementation of the E-type approach (for some discussion of the choices see Heim 1990, Neale 1990, and Chierchia 1991). The logical form for (1) is then amended to (4).

(4) a. Often$_S$ [$_S$ a farmer owns a donkey] [$_S$ the farmer beats the donkey]
    b. "Many situations in which there is a farmer and there is a donkey that the farmer owns are such that the farmer beats the donkey."

One last modification has to be made. In her dissertation, Heim had argued very forcefully against the E-type construal of donkey pronouns using among others her now famous sage plant example, a conditional version of which is given in (5).

(5) If someone buys a sage plant here he usually buys eight others with it.

The problem of course is that there won't be a unique sage plant that the definite description hidden in the E-type pronoun can felicitously refer to. The situation-based account has an answer to this problem. Berman (1987) suggested having the adverb quantify solely over the minimal elements in the set of situations supplied as its first argument. The quantificational adverb *always*, for example, will take two sets of situations and will demand that all the miminal situations in the first set are part of a situation in the second set. The new paraphrases for the sage-plant example and for our stock example are given in (6).

---

[2] An early proposal along these lines was made by Greg Stump (1981, 1985).

[3] At this point, I will not attempt any comparison with the "West Coast" theory of situation semantics (Barwise & Perry 1983, etc.)

(6) a. "Most of the minimal situations in which someone buys a sage plant here are part of a larger situation in which that someone buys eight other sage plants with the one in the minimal situation."

b. "Many of the minimal situations in which there is a farmer and there is a donkey that the farmer owns are are part of a larger situation in which the farmer beats the donkey."

Since we plan to integrate all sorts of conditionals into the picture, we need to be clear about what conditionals are doing in adverbially quantified sentences. The conventional wisdom is that *if*-clauses provide the domain of quantification, they restrict the adverb of quantification. I would like to spell this out in a way that can be extended to account for other types of conditionals.

First, I will assume that adverbs of quantification denote relations between sets of situations. That is, adverbs of quantification can be treated as quantifiers in the tradition of generalized quantifier theory (for detailed discussion the reader is referred to Schwarzschild 1988, 1990, and de Swart 1991). For example, *always* will denote the subset relation (modified to allow for Berman's minimality trick).

The first argument of the quantifier is special. Adopting a suggestion by Mats Rooth (1985, 1989, 1991), I assume that the first argument of an adverb of quantification is a free variable C that can be restricted in various ways: explicitly by an *if*-clause, or implicitly by accommodating presupposed material.[4]

The second argument of the adverbial quantifier is supplied by the matrix clause minus the adverb. The general schema for the interpretation of adverbially quantified sentences with a restrictive *if*-clause is given in (7). Example (1) is now analyzed as in (8).[5]

(7) $\textbf{if}\ R\ Q\ [C]\ [M] = Q\ [C \cap R]\ [M] =$
Q-many of the minimal situations in $C \cap R$ are part of a situation in M.

R: the antecedent proposition used to restrict C
Q: the interpretation of the adverb of quantification
C: the set of currently relevant circumstances
M: the interpretation of the main clause minus the adverb

---

[4] Assuming C to be a variable over sets of situations is a simplification. Angelika Kratzer (1978) has shown that the first argument, the conversational background in her terminology, is actually of a higher type. Non-trivial issues are at stake here and this is one of the most pressing needs for further elaboration.

[5] Another issue that I skirt here concerns the question of compositionality of the treatment in (11). Obviously, the conditional opertaor here magically operates inside the internal structure of the expression it combines with syntactically.

(8) a. [**if** (∃x ∃y (farmer(x) owns donkey(y))],
many [C] [the farmer beats the donkey].

b. "Many of the minimal situations in the set of currently relevant situations in which there is a farmer and there is a donkey and the farmer owns the donkey are part of a larger situation in which the farmer beats the donkey."

2. The Semantics of Complex Conditionals

Next we will have to specify what exactly the different kinds of complex conditionals (*unless*, *only if*, *even if*) mean.

2.1 *Unless*

What about *unless* under this perspective? In numerous textbooks and grammars we can find the traditional view that *unless* is equivalent to *if...not*. A typical example like (9a) is paraphrased by (9b).

(9) a. I will leave *unless* Bill calls soon.
b. I will leave *if* Bill doesn't call soon.

Taken together with the semantics for *if* as marking a restrictive operator on the domain of an adverbial quantifier, this would suggest that *unless* is a subtractive or exceptive operator on quantifiers. Something along the lines of (10) seems called for. The example in (9a) then gets a paraphrase as in (11)

(10) **unless** R, $Q\,[C]\,[M] = Q\,[C - R]\,[M]$

(11) "All of the minimal situations in the set of currently relevant situations except the ones in which Bill calls soon are part of a larger situation in which I leave." (modulo modality and tense)

In von Fintel (1991) I discussed in some detail the advantages of this approach to the meaning of *unless*, which can be traced back to Geis (1973). I argued there not only that *unless* is a subtractive operator on quantifier domains, but also that there is an additional implicature: the *unless*-clause states the only exception to the quantified proposition. The *except*-paraphrase employed in (11) almost captures that ingredient. As far as I can see, this uniqueness implicature does not interact with donkey-anaphora, which is why I will ignore this complication here.

2.2 Focus Adverbs + *If*

The guiding principle in our dealings with *only if*- and *even if*-conditionals will be that in them the focus adverbs *only* and *even* have the same meaning that they have in cases where they are attached to non-conditional statements. That is we should be able to take a semantics for the focus adverbs *only* and *even* and combine it with a semantics for *if*-clauses and get as a result a satisfactory analysis of *only if* and *even if*-conditionals.[6]

As far as the semantics of focus is concerned, I will stay fairly informal at this point and trust that my suggestions here can be spelled out in more detail in either Rooth's (1985, 1989, 1991) alternative semantics or the structured propositions approach of Krifka (1991, 1992) and others. All we need to assume for now is that focussing evokes a set of relevant contrasts to the focussed item. There are relevant contrasts to individuals, to properties, to propositions, etc. The sentence *JOHN stole the book* evokes a set of relevant contrasts to John, presumably other possible culprits. The sentence *John SWIMS* evokes a set of relevant contrasts to swimming, perhaps other exercise activities. The sentence *The SUN'S shining* might evoke a set of relevant contrasts to the proposition that the sun is shining, perhaps other possible weather conditions. I will use the following notation: $X \approx \boldsymbol{\alpha}$ to mean that X is a relevant contrast to the denotation of the expression α. For example, $X \approx \mathbf{John}$ means that X is a relevant contrast to the denotation of *John*, presumably someone named John.

2.3 *Only + If = Only If*

The semantics I will assume for *only* is this: it asserts that the focussed item is the only one from the set of relevant contrasts that can be truthfully combined with the rest of the sentence. There is in addition an implicature that the sentence without *only* is true.[7] For a sentence like (12a) this will give us roughly the semantics in (12b).

(12) a. John only SWIMS.
b. $\forall X_{\approx \mathbf{swim}}: X(\mathbf{j}) \rightarrow X = \mathbf{swim}$
Implicature: John swims.

That is, (12a) will be true iff the only property comparable to swimming that truthfully applies to John is swimming itself: if John does anything it all, it is only swimming. In addition, it is implicated that John does in fact swim.

What happens when we combine this with our semantics for conditionals? What is the meaning we get for (13)?

(13) Only if you help me will I do the dishes.

Let us assume for now that what is focussed in (13) is the complement of *if*, that is the clause *you help me*. What we get is (14).[8]

---

[6] In this I agree with the sentiments expressed by Lycan (1991). An early attempt at analyzing *only if* into *only* and *if* can be found in McCawley (1974).

[7] This is the standard treatment as argued for by Horn (1969).

[8] The inner quantifier in (OJ) represents the universal quantification over situations triggered by the modal *will*. Note that the semantics proposed here seems to predict that *only if*-conditionals will be uncomfortable with left-monotone increasing adverbial quantifiers. The reason is that they will make it almost impossible for there to be a uniquely adequate restrictor set. I will leave detailed discussion of this for a future occasion.

(14) $\forall X_{\approx \textbf{you help me}} : \forall(C \cap X.\textbf{I do the dishes}) \rightarrow X = \textbf{you help me}$
Implicature: If you help me, I will do the dishes.

What (14) says is that the only circumstance in which I will do the dishes is one in which you help me.

2.4 *Even* + *If* = *Even If*

The semantics I will assume for *even* is this: it implicates that there is a property from the set of relevant contrasts to the focussed item that was more likely to be able to be truthfully combined with the rest of the sentence than the focussed item itself.[9] For a sentence like (15a) this will give us the semantics in (15b).

(15) a. John even SWIMS.
b. John swims.
Implicature: $\exists X_{\approx \textbf{swim}} : \textbf{swim}(\textbf{j}) <_{p} X(\textbf{j})$

That is, (15a) will be true iff John swims. There is an additional implicature that there is a property comparable to swimming that was more likely true of John than swimming itself.

What happens when we combine this with our semantics for conditionals? What is the meaning we get for (16)?

(16) Even if you help me I won't do the dishes.

Let us again assume that what is focussed is the complement of *if*, that is the clause *you help me*. What we get is (17).

(17) If you help me I won't do the dishes.

Implicature:
$\exists X_{\approx \textbf{you help me}} : \textbf{no}(C \cap \textbf{you help me}.\textbf{I do the dishes})$
$<_{p} \textbf{no}(C \cap X.\textbf{I do the dishes})$

The implicature of (17) is that there are circumstances other than your helping me in which it is even more likely that I won't do the dishes.

3. Complex Conditionals and Donkey-Anaphora

We now embark on our investigation of the interaction of complex conditionals and donkey-anaphora. The first observation is that in general the possibility of donkey-anaphora seems severely limited with complex conditionals. The crucial data are given in (18) and (19).

---

[9] The proper semantics for *even* is in much more dispute than the one for *only*. Some of the relevant references are: ... I am staying at a fairly superficial level of analysis at this point and hereby apologize to the true connoisseurs.

(18) a. If a farmer owns a donkey, he often beats it.

b. $\left\{\begin{array}{l}\text{*Unless}\\ \text{*Even if}\end{array}\right\}$ a farmer owns a donkey, he often beats it.

c. $\left\{\begin{array}{l}\text{*Only if}\\ \text{*If and only if}\end{array}\right\}$ a farmer owns a donkey, does he often beat it.

(19) a. If anyone objects, I will talk to him.

b. $\left\{\begin{array}{l}\text{*Unless}\\ \text{*Even if}\end{array}\right\}$ anyone objects, I will talk to him.

c. $\left\{\begin{array}{l}\text{*Only if}\\ \text{*If and only if}\end{array}\right\}$ anyone objects, will I talk to him.

Our theory should not be too successful in deriving the illformedness of donkeys with complex conditionals, however. The data in (20) show that if material in the conditional other than the indefinite is focussed the indefinite can serve as the antecedent for a donkey pronoun in the matrix.

(20) a. $\left\{\begin{array}{l}\text{Unless}\\ \text{Even if}\end{array}\right\}$ a farmer is RICH, he shouldn't beat his donkeys.

b. $\left\{\begin{array}{l}\text{Only if}\\ \text{If and only if}\end{array}\right\}$ a farmer is RICH, should he beat his donkeys.

c. $\left\{\begin{array}{l}\text{Unless}\\ \text{Even if}\end{array}\right\}$ you $\left|\begin{array}{l}\text{*own}\\ \surd\text{OWN}\end{array}\right|$ a donkey, you shouldn't beat it.

d. $\left\{\begin{array}{l}\text{Only if}\\ \text{If and only if}\end{array}\right\}$ you $\left|\begin{array}{l}\text{*own}\\ \surd\text{OWN}\end{array}\right|$ a donkey, should you beat it.

The challenge for the general theory of donkey-anaphora and for the semantics of conditional clauses then is to explain (i) the general unavailability of donkey-anaphora in complex conditionals and (ii) the possibility of donkey-anaphora in special circumstances. In this section, I will lay out why donkey-anaphora is generally impossible with complex conditionals. In the Section 4, I will turn to the cases in (20).

3.1 *Unless*

Why do *unless*-clauses not allow donkey anaphora? It is important to realize at this point that within the framework assumed here the availability of donkey-anaphora is not a question of syntactic or semantic scope. Instead, the operative question is: *Is there an appropriate entity in the antecedent situation to refer back to with a disguised definite description*? Consider now the contrast in (21).

(21) a. If anyone objects, I will talk to him.
b. *Unless anyone objects, I will talk to him.

Take (21a). The donkey pronoun *him* in the main clause is interpreted as an E-type pronoun, as a disguised definite description, something like *the man who objects* or *the objector*. This interpretation meshes successfully with the meaning of the rest of the sentence, which as a whole can be paraphrased as "All of the minimal situations in which someone objects are part of a larger situation in which I will talk to the objector".

The analysis for (21b) with the *unless*-conditional will be something like (22).

(22) a. $\forall(C-\{s \mid \exists x\ (x \text{ objects in } s)\})$ (I talk to the objector)
b. "All of the minimal situations in the set of currently relevant situations except the ones in which someone objects are part of a larger situation in which I talk to the objector".

This is patently nonsensical. In a situation where no one objects there is no objector to talk to. More precisely, the E-type pronoun carries an existence presupposition: simply that in each of the cases considered there exists an objector. The *unless*-clause on the other hand removes exactly those situations where there is an objector from the domain of quantification. The presupposition of the E-type pronoun therefore cannot be fulfilled. (21b) then is deviant because of a presupposition failure.

3.2 'Only if'

What is wrong with (23)?

(23) *Only if someone objects will I talk to him.

(24) a. $\forall X_{\approx \textbf{someone objects}} : \forall(C \cap X, \textbf{I talk to the objector}) \rightarrow X \approx \textbf{someone objects}$
b. "The only type of situation comparable to ones where someone objects which is such that in all of those situations I talk to the objector are those in which someone objects".

Of course, (24b) is kind of hard to parse. But a moment of reflection will reveal that our sentence (23) asserts as a whole what is already presupposed by one of its parts. The E-type prounoun *him*, interpreted as 'the one who objects', already presupposes that all of the situations under consideration are such that there is an objector. Saying that the only situations in which I will talk to the objector are such that someone objects in them is dangerously redundant. Is this enough to make this as ungrammatical as it is? This is what Robert Stalnaker has to say:

> "The boundaries determined by presuppositions have two sides. One cannot normally assert, command, promise, or even conjecture what is inconsistent with what is presupposed. Neither can one assert, command, promise or conjecture what is itself presupposed. There is no point in expressing a proposition unless it distinguishes among the possible worlds which are considered live options in the context." (Stalnaker 1972: 388)

This would mean that there is no point in uttering (23). But is that enough to make it ungrammatical? After all, we all are guilty of making useless utterances every now and then without therefore being classified as incompetent speakers of English. The argument in the case of (23) would have to be that it is structurally pointless, in some sense of 'structurally'. The issue is a vexing one and recurs frequently in semantic accounts of ungrammaticality.[10] In the absence of a better account for the illformedness of (23) I will rest my case for now.

3.3 *Even If*

What's wrong with (25)? According to our semantics, (25) will have the implicature in (26).

(25) *Even if anyone objects I will talk to him.

(26) $\exists X_{=\text{someone objects}} : \mathbf{all}(C \cap \textbf{someone objects}, \textbf{I talk to the objector}) <_p \mathbf{all}(C \cap X, \textbf{I talk to the objector})$

This implicature is nonsensical. The set of relevant contrasts to anyone's objecting will presumably be made up of alternative situations in which no one objects. None of those can be more likely to be such that I will talk to the one who objects than the ones in which someone actually does object. Again, the E-type pronoun already presupposes that all the situations considered contain an objector, hence a set of contrasting situations where no one objects will be useless. And again, we have to resort to vigorous hand-waving to get from this built-in pragmatic anomaly to the ungrammaticality of (26).

4. Focus-Induced Constraints on Domains

We will now have to deal with the data in (20), which show that if material in the conditional other than the indefinite is focussed the indefinite can serve as the antecedent for a donkey pronoun in the matrix. How come?

(20) a. $\left\{\begin{matrix}\text{Unless}\\ \text{Even if}\end{matrix}\right\}$ a farmer is RICH, he shouldn't beat his donkeys.

b. $\left\{\begin{matrix}\text{Only if}\\ \text{If and only if}\end{matrix}\right\}$ a farmer is RICH, should he beat his donkeys.

c. $\left\{\begin{matrix}\text{Unless}\\ \text{Even if}\end{matrix}\right\}$ you $\left|\begin{matrix}\text{*own}\\ \surd\text{OWN}\end{matrix}\right|$ a donkey, you shouldn't beat it.

d. $\left\{\begin{matrix}\text{Only if}\\ \text{If and only if}\end{matrix}\right\}$ you $\left|\begin{matrix}\text{*own}\\ \surd\text{OWN}\end{matrix}\right|$ a donkey, should you beat it.

---

[10] A prominent example is Barwise & Cooper's (1981) attempt of reducing the definiteness effect in existential sentences to a presupposition clash, cf. the criticism in Keenan (1987). Similarly, von Fintel (1992) motivates the co-occurrence restrictions of exceptive operators by the observation that the ungrammatical collocations would automatically result in contradictions. See Ladusaw (1986) for some general discussion of 'semantic filtering'.

4.1 *Unless*

Here's my story. What is the difference between the cases where donkey anaphora is unavailable and those where it is o.k.? Let us meditate on the specific contrast in (27).

(27) Unless you $\left|\begin{matrix}\text{*own}\\ \checkmark\text{OWN}\end{matrix}\right|$ a donkey, you shouldn't beat it.

Why should stress on the verb make it possible that the object is available as an antecedent for a donkey pronoun? After all, *unless* will still remove all the situations where you own a donkey. Where is the donkey that *it* refers back to?

The intuition I will develop is that the focus on the verb signals that we are contemplating alternative relations between you and a donkey, and we are saying that none of those except the ones that are owning relations entitle you to beating it. The donkey will exist in all the situations considered. Hence the donkey pronoun is licit.

Assume that, following Rooth (1985 etc.), in the interpretation of *you OWN a donkey*, we compute not only the ordinary denotation $\|$*you own a donkey*$\|^{o}$, but also the set of relevant contrasts to the ordinary denotation, call it $\|$*you OWN a donkey*$\|^{P}$. In terms of our earlier notation this will turn out to be the set $\{X: X \approx \|$*you own a donkey*$\|^{o}\}$.

What use is this set? Well, it seems to be the set of alternatives being talked about. A natural move now would be to say that the first argument C of the adverbial quantifier modified by the *unless*-conditional is identified with or restricted to this set of alternatives. The proposal is seen in (28).

(28) **unless** $\|R\|^{o}$. $Q[C][M] = Q[C - \|R\|^{o}][M]$

Focus-induced constraint: $C \subseteq \|R\|^{P}$

If the donkey is supposed to exist in every situation in $\|R\|^{P}$, we have to be very careful about what to admit into the set of relevant contrasts to the owning-relation. If we consider all possible binary relation between a person and a donkey there will be lots and lots of those and in particular many that do not entail the existence of the donkey. For example, this is a binary relation between me and a donkey: "living in the same century as an artist who painted a picture of". This problem is discussed in by Rooth (1991). For our stock example, that means that the domain of quantification will have to be all those situations that contain you standing in an owning-type relation (borrowing/leasing/renting/etc.) to a donkey. From now on, I will assume that $\|R\|^{P}$ is the set of relevant contrasts, however that is computed.

4.2 *Only If* and *Even If*

The explanation of the contrasts in (29) runs along the same lines.

(29) a. Only if you $\left\{\begin{matrix}{}^{*}\text{own}\\ {}^{\surd}\text{OWN}\end{matrix}\right\}$ a donkey, should you beat it.

b. Even if you $\left\{\begin{matrix}{}^{*}\text{own}\\ {}^{\surd}\text{OWN}\end{matrix}\right\}$ a donkey, you shouldn't beat it.

The evoked set of alternative situations to your owning a donkey will be comprised solely of situations where there is in fact a donkey that is owned/borrowed/leased. Hence, the E-type pronoun *it* will succesfully refer.

4.3 A Mystery: Narrow CN-Focus

Consider the contrast in (30), which should be read under narrow focus on the common noun *donkey* as indicated by the context sentence.

(30) Farmers around here in New England are pretty nice to their pack animals.

a. Only if a farmer owns a DONkey does he beat it.
b. Even if a farmer owns a DONkey he doesn't beat it.
c. $^{??}$Unless a farmer owns a DONkey he doesn't beat it.

d. Only if it's a DONkey that a farmer owns does he beat it.
e. Even if it's a DONkey that a farmer owns he doesn't beat it.
f. $^{?}$Unless it's a DONkey that a farmer owns he doesn't beat it.

Under the intended interpretation the focus on the common noun should evoke a contrast set of pack animals. The E-type pronoun should be able to refer to the pack animal that a farmer owns. It seems that this is indeed available with the *only if-* and *even if-*conditionals. But something still obstructs the successful pack animal-anaphora with *unless*-clauses. This is a mystery to me.

4.4 Focus and *If*-Conditionals: The Proportion Problem

Does the semantics of *if* have to be focus-conscious, too? There are suggestions in the literature that say yes. The question arises in the context of the so-called 'proportion problem', which is a serious problem for the unselective binding approach to donkey anaphora. The crucial observation is that there is a prominent reading of (31) that does not quantify over farmer-donkey pairs but over donkey-owning farmers. The empirical test consists in judging whether a very rich farmer owning hundreds of donkeys would tip the balance. The consensus is that there is a reading where it doesn't matter how many donkeys a farmer owns: we are just quantifying over donkey-owners.

(31) If a farmer owns a donkey, he is happy.

The problem is of course that any unselective approach would have the higher operator bind both indefinites in the restrictive *if*-clause, thus predicting that (31) is counting farmer-donkey pairs. A way of selecting the correct quantifiees is needed.

There are quite a variety of ideas on the market on how to deal with this selection problem. Kratzer (1989a) and Diesing (1990) suggest that only indefinites that can be scrambled outside the VP can be captured.[11] Chierchia (1991) appeals to a process of topic-selection, so far unreduced to other mechanisms. All of these bear a close relation to focus phenomena. Let me sketch how a focus-sensitive semantic rule for conditionals would fare with the proportion problem.[12]

Within a situation-based approach, the task boils down to finding a principled way of deriving the set of situations specified in (32), from Heim (1990), as the domain of quantification.

(32) $\{s: \exists x[x \text{ is a farmer in } s \;\&$
$\exists s'[s \leq s' \;\&\; \exists y[y \text{ is a donkey in } s' \;\&\; x \text{ owns } y \text{ in } s']]]\}$

The minimal situations in the set of situations in (32) will contain a farmer and not much else. All of them will be extendable into bigger situations containing donkeys that the farmer owns. Any of the farmers quantified over will therefore be donkey-owners. But the number of donkeys owned plays no role for the evaluation of the quantified statement. The desired farmer-donkey asymmetry is achieved. Heim (1990) derives (32) via syntactic manipulations at LF. Can we get the same result by using the focus story?

Let's assume, maybe not too recklessly, that there is focus on the verb phrase in the asymmetric reading of (31).[13] The input to the semantics therefore will be (33).

(33) If a farmer [owns a donkey]$_F$, he is happy.

Try this on for size. The presupposition value for the complement of *if* will be all the situations containing a farmer where the farmer has some property in the contrast class of donkey-owning. Now, we could say that this set is pared down further by making sure that all these situations are **part** of a situation where the farmer owns a donkey. This will weed out all the non-donkey-owning farmers. But the domain of quantification are still just situations with a farmer and some property. This will mean that the adverb will in fact quantify over farmers. The proposal in (34) is what we seem to need. Sentence (31) under the asymmetric reading will be interpreted as in (35).

---

[11] Diesing only applies the account to indefinites in the matrix, while Kratzer extends the mechanism to tackle the proportion problem.

[12] At this point, a comparison with the related approach proposed in Krifka (1992) is called for but cannot yet be offered.

[13] This assumption needs to be investigated in detail by looking at different verb classes and different focus assignments.

(34) **if** $\|R\|^{O}\, Q\,[C]\,[M] = Q\,[\,C \cap \{s \mid \exists s'(s' \geq s \;\&\; s' \in \|R\|^{O})\}\,]\,[M]$

Focus-induced constraint: $C \subseteq \|R\|^{P}$

(35) "All of the minimal situations in the set of currently relevant situations in which there is a farmer with some property of the donkey-owning type and which are part of a situation in which there is a farmer who owns a donkey are part of a larger situation in which the farmer is happy."

We have a problem. The unfocussed existential quantifier *a farmer* from the *if*-clause will be interpreted twice, once in $\|R\|^{P}$ and once in $\|R\|^{O}$. Note the double occurrence of "there is a farmer..." in the paraphrase in (35). There is no guarantee that we are talking about the same farmer. In effect, any farmer will be in the domain of quantification as long as there is one donkey-owning farmer in the world. How can we make sure that only donkey-owning farmers are considered? Heim had no problems with this, since in her LF-approach there was no second occurrence of the existential quantifier. Instead, there was a trace interpreted as a bound variable. The more purely semantic account that we are pursuing here has no such option.

What we need is a relation between the farmer-situations quantified over and the farmer-donkey-owning situations that is stronger than the mere part-of relation. Within the machinery of situation semantics there is in fact such a stronger relation. Not only can we say that a proposition is true in a situation ($s \in p$), but we can also construct a notion of a situation being a fact that makes a proposition true, which is somewhat stronger. Building on that notion we can then use a more selective part-of relation which does the right thing for our problem. Angelika Kratzer (1990, 1991) gives the definition in (36).

(36) *Facts that make propositions true*
If s is any situation and p any proposition, then s is a fact that makes p true iff for all s' such that $s' \leq s$ and $s' \notin p$, there is an s" such that $s' \leq s'' \leq s$, and s" is a minimal situation in which p is true.

Essentially, this definition ensures that a fact that makes a proposition true does not contain any situation that doesn't contribute to the truth of the situation, it doesn't contain any irrelevant stuff. That is what we needed. The non-donkey-owning farmers do not contribute to the truth of "there is a farmer who owns a donkey". So they can be filtered out. The amended semantics for *if* is given in (37) and sentence (31) gets the paraphrase in (38).

(37) **if** $\|R\|^{O}\, Q\,[C]\,[M] = Q\,[\,C \cap \{s \mid \exists s'(s' \geq s \;\&$
s' is a fact that makes $\|R\|^{O}$ true$)\}\,]\,[M]$

Focus-induced Constraint: $C \subseteq \|R\|^{P}$

(38) "All of the minimal situations in the set of currently relevant situations in which there is a farmer with some property of the donkey-owning type and which are part of a larger situation which is a fact that makes it true that there is a farmer who owns a donkey are part of another larger situation in which the farmer is happy."

We have now successfully mimicked Heim's situation-based approach to the proportion problem in a way that uses focus-induced presupposition accommodation rather than LF-maneuvers.[14]

4.5 Back to 'Unless'

The focus-sensitive semantics for *unless* formulated earlier in (28) did not make reference to the elaborate notion of a fact making a proposition true. Can we harmlessly incorporate this into the meaning of *unless* in order to achieve a uniform schema for the interpretation of conditionals? Is (39) adequate?

(39) $$\textbf{unless}\ \|R\|^{O}\ Q\ [C]\ [M] = Q\ [\ C - \{s \mid \exists s'(s' \geq s\ \&\ s' \text{ is a fact that makes } \|R\|^{O} \text{ true})\}\ ]\ [M]$$

At the moment, I can't see anything wrong with (39).

5. The Relation Between Focus and Scoping

After having developed a fairly successful theory of how complex conditionals and donkey-anaphora interact, it is time to see what these facts tell us about the roots of semantic partition.

5.1 Focus and IP-Internal Scrambling

The crucial innovation of my account is that focus-induced contrast sets are used to restrict the domain of quantification in such a way that donkey-anaphora is made possible. Can this effect of making indefinites in complex conditionals available for donkey anaphora be achieved in a more syntactic way?

Gennaro Chierchia (1991) proposes that only indefinites that are topics are captured by adverbial quantifiers. That seems to be on the right track, see also Barbara Partee's (1991) work on the connection between topic-focus articulation and quantification. We can see my proposal as an implementation of this general idea. But there could of course be more syntactic reflexes of topic-hood that may play a more primary role. Chierchia himself just takes topic-marking as a primitive in his system, deferring discussion. Let's do some of the required work.

Molly Diesing (1990) and Angelika Kratzer (1989a) have devised a system which postulates an asymmetry between material inside the verb phrase and material higher than the verb phrase. Since they close off the VP by an operation of existential closure, only indefinites that find themselves outside the VP at the crucial level (LF) remain unscathed and can be captured by a higher quantifier. Maybe we can mentally associate the VP-material with the notion of focus and the higher material with topic-hood.

---

[14] Again, this is not the place to compare the focus-based approach to the LF-approach. Also, we will have to ignore for the moment the criticisms of the situation-based approach put forward in Chierchia (1991).

Let us look at an example.

(40) Unless you $\left\{\begin{matrix}\text{*own}\\ \surd\text{OWN}\end{matrix}\right\}$ a donkey, you shouldn't beat it.

Assuming for the time being that we can establish a connection between focus on the verb and LF-scrambling of the object, the LFs for the sentences in (40) will look somehow like the ones in (41).

(41) a. should [unless you $\exists_x$[VP own a donkey$_x$]] [you not beat it$_x$]
b. should$_x$ [unless you a donkey$_x$ [VP own x]] [you not beat it$_x$]

The unscrambled indefinite object in (41a) gets bound off by the VP Existential Closure and cannot be captured by the quantifier *should*. In (41b), the object has scrambled and can get bound by the quantifier and the donkey pronoun is licensed too.

Superficially, this may look right, but look closer. The indefinite is still inside the *unless*-clause. And *unless* has a distinctly negative meaning. However we want to express the meaning of *unless* in this framework (it would have to subtract tuples of variable length I guess), it seems that as long as the indefinites are buried inside the *unless*-clause they won't be able to restrict the quantifier. I think that the correct LF for the well-formed sentence in (40) should be as in (42).

(42) should$_x$ [a donkey$_x$ [unless you own x]] [you not beat it$_x$]

Very well, but how did the indefinite escape the *unless*-clause? Not by syntactic movement! Like other adverbial subordinators, *unless* creates a hefty barrier against syntactic movement as (43) demonstrates.

(43) *Who will you call Kim if/when/unless/although/because you see t?

It seems then that the cases of defocussed indefinites in complex conditionals presented here offer a strong argument that focus-induced restrictions of adverbial quantifiers cannot be reduced to syntactic processes.

5.2 Deep Embeddings

Angelika Kratzer pointed out to me a type of example that can be used to show that the focus-story I have told does need to be supplemented with a scoping mechanism of some sort. Consider the data in (44).

(44) a. Unless you are absolutely sure that you OWN a donkey, you shouldn't beat it.
b. Unless you know the person who OWNS a donkey, you shouldn't beat it.
c. Unless you are wondering whether you might BUY a donkey, you shouldn't look it in the mouth.

Here, the set of relevant alternatives clearly won't be such that all of them guarantee the existence of a donkey. For example, the set of situations where you are absolutely sure that you own a donkey or are borrowing a donkey or are leasing a donkey does not invariably entail the existence of such a donkey. You may be mistaken.

It seems to me that to be grammatical the sentences in (AK) have to be read with a *de re* interpretation of the donkey. The most popular account for *de re*-readings is of course based on scoping. What we have to do then is to scope the indefinite *a donkey* to right under *unless*. This should be possible since the islands here are of the weak sort. Compare the essentially grammatical examples of extraction out of these contexts in (45).

(45) a. ?This is a donkey that I'm absolutely sure that I own.
b. ?This is a donkey that I know the person who owns.
c. ?This is a donkey that I'm wondering whether I might buy.

Now, quite possibly the scoping is not available on the first parse of the sentences in (44). We could perhaps say that it is the existence presupposition of the E-type pronoun that triggers the scoping.

It seems then that the data in (44) offer a strong argument that the effect of syntactic scoping on the domain selection of adverbial quantifiers cannot be entirely reduced to focus phenomena. Taken together, the results presented here argue for a peaceful co-existence of the focus effects and the syntactic mechanisms. Neither can be entirely reduced to the other.

Left open is the plausible conception that in the unmarked case the two phenomena are highly correlated. Defocussing an item is then correlated with it taking a syntactic position outside of the typical focus domain, the VP. This whole area is under active investigation and promises fruitful results for the syntax and semantics of quantification.

References

Barker, Stephen: 1991, '*Even*, *Still*, and Counterfactuals', *Linguistics and Philosophy* **14**, 1-38.

Barwise, John and Robin Cooper: 1981, 'Generalized Quantifiers and Natural Language', *Linguistics and Philosophy* **4**, 159-219.

Barwise, Jon and John Perry: 1983, *Situations and Attitudes*, MIT Press.

Bennett, Jonathan: 1982, '*Even If*', *Linguistics and Philosophy* **5**, 403-418.

Berman, Steve: 1987, 'Situation-Based Semantics for Adverbs of Quantification', in Jim Blevins and Anne Vainikka (eds.), *University of Massachusetts Occasional Papers* **12**, GLSA, University of Massachusetts, Amherst.

Chierchia, Gennaro: 1991, 'Anaphora and Dynamic Binding', *Linguistics and Philosophy*.

Condoravdi, Cleo: 1992, 'Weakly and Strongly Novel Noun Phrases', Talk at WCCFL XI, UCLA.

Cooper, Robin: 1979, 'The Interpretation of Pronouns', in F. Heny and H. Schnelle (eds.), *Syntax and Semantics* **10**, 61-92.

Diesing, Molly: 1990, *The Syntactic Roots of Semantics Partition*, Ph.D. Dissertation, GLSA, University of Massachusetts at Amherst.

Evans, Gareth: 1980, 'Pronouns', *Linguistic Inquiry* **11**, 337-362.

von Fintel, Kai: 1991, 'Exceptive Conditionals: The Meaning of *Unless*', *NELS* **22**.

von Fintel, Kai: 1992a, 'Adverbs of Quantification, Conditionals, and Presupposition Accommodation', *WCCFL* **11**.

von Fintel, Kai: 1992b, 'Exceptive Constructions', to appear in *Natural Language Semantics* **1**.

Geis, Michael: 1973, '*If* and *Unless*', in Braj B. Kachru, Robert B. Lees, Yakov Malkiel, Angelina Petrangeli, and Sol Saporta (eds.) *Issues in Linguistics: Papers in Honor of Henry and Renée Kahane*, University of Illinois Press, Urbana, pp. 231-253.

Geis, Michael: 1985, 'The Syntax of Conditional Sentences', *Ohio State University Working Papers in Linguistics* **31**, 130-159.

Heim, Irene: 1982, *The Semantics of Definite and Indefinite Noun Phrases*, Ph.D. Dissertation, GLSA, University of Massachusetts, Amherst.

Heim, Irene: 1990, 'E-Type Pronouns and Donkey Anaphora', *Linguistics and Philosophy* **13**, 137-178.

Horn, Larry: 1969, 'A Presuppositional Analysis of *only* and *even*', *CLS* **5**, 218-227.

Kamp, Hans: 1981, 'A Theory of Truth and Semantic Representation', in Jeroen Groenendijk et.al. (eds.), *Truth, Interpretation and Information*, Foris, Dordrecht.

Karttunen, Lauri and Stanley Peters: 1979, 'Conventional Implicature', *Syntax and Semantics, Volume 11: Presupposition*, Academic Press, New York, 1-56.

Kay, Paul: 1990, 'Even', *Linguistics and Philosophy* **13**, 59-111.

Keenan, Edward: 1987, 'A Semantic Definition of "Indefinite NP"', in Eric Reuland and Alice ter Meulen (eds.), *The Representation of (In)definiteness*, MIT Press, pp. 286-317.

Kratzer, Angelika: 1978, *Semantik der Rede: Kontexttheorie - Modalwörter - Konditionalsätze*, Scriptor.

Kratzer, Angelika: 1989a, 'Stage-Level and Individual-Level Predicates', in Emmon Bach, Angelika Kratzer, and Barbara Partee (eds.), *Papers on Quantification: NSF Grant BNS 8719999*, Department of Linguistics, University of Massachusetts at Amherst. [ms. dated December 1988].

Kratzer, Angelika: 1989b, 'An Investigation of the Lumps of Thought', *Linguistics and Philosophy* **12**, 607-653.

Kratzer, Angelika: 1990, 'How Specific is a Fact?', ms, University of Massachusetts, Amherst.

Kratzer, Angelika: 1991, 'Pseudoscope: Ambiguities in Opaque Contexts', Talk at ASL/LSA Conference on Logic and Linguistics, Santa Cruz.

Krifka, Manfred: 1991, 'A Compositional Semantics for Multiple Focus Constructions', in Steven Moore and Adam Zachary Wyner (eds.), *Proceedings of the First Semantics and Linguistic Theory Conference (SALT I)*, Cornell University Working Papers in Linguistics **10**, 127-158.

Krifka, Manfred: 1992, 'Focus, Quantification, and Dynamic Interpretation', ms, University of Texas at Austin.

Ladusaw, William: 1986, 'Principles of Semantic Filtering', *WCCFL* **5**, 129-141.

Lewis, David: 1975, 'Adverbs of Quantification', in Edward L. Keenan (ed.), *Formal Semantics of Natural Language*, Cambridge University Press, pp. 3-15.

Lycan, William: 1984, 'A Syntactically Motivated Theory of Conditionals', in P. French, T.E. Uehling, and H. Wettstein (eds.), *Midwest Studies in Philosophy, Vol. IX: Causation and Causal Theories*, University of Minnesota Press, Minneapolis.

Lycan, William: 1991, '*Even* and *Even If*', *Linguistics and Philosophy* **14**, 115-150.

McCawley, James: 1974, '*If* and *Only if*', *Linguistic Inquiry* **5**, 632-635.

Partee, Barbara: 1991, 'Topic, Focus, and Quantification', in Steven Moore and Adam Zachary Wyner (eds.), *Proceedings of the First Semantics and Linguistic Theory Conference (SALT I)*, Cornell University Working Papers in Linguistics **10**, 159-187.

Rooth, Mats: 1985, *Association with Focus*, Ph.D. Dissertation, GLSA, University of Massachusetts at Amherst.

Rooth, Mats: 1989, 'Indefinites, Adverbs of Quantification, and Focus', ms.

Rooth, Mats: 1991, 'A Theory of Focus Interpretation or What is the Source of Association with Focus Ambiguities?', ms.

Schwarzschild, Roger: 1988, 'Adverbs of Quantification as Generalized Quantifiers', *NELS* **19**.

Schwarzschild, Roger: 1990, 'Eselsatzwissenschaft', ms, University of Massachusetts, Amherst.

Stalnaker, Robert: 1972, 'Pragmatics', in Donald Davidson and G. Harman (eds.), *Semantics of Natural Language*, Reidel, Dordrecht, pp. 380-397.

Stump, Greg: 1981, *The Formal Semantics and Pragmatics of Free Adjuncts and Absolutes in English*, Ph.D. Dissertation, Ohio State University.

Stump, Greg: 1985, *The Semantic Variability of Absolute Constructions*, Reidel, Dordrecht.

de Swart, Henriëtte: 1991, *Adverbs of Quantification: A Generalized Quantifier Approach*, Ph.D. Dissertation, Rijksuniversiteit Groningen.

de Swart, Henriëtte: 1992, 'Genericity, Scope, and the Weak/Strong Distinction', Talk at WCCFL XI, UCLA.

Author's Address:

Kai von Fintel
Dept. of Linguistics
South College
University of Massachusetts
Amherst, MA 01003

Fintel@Linguist.Umass.Edu

Focus and Ellipsis in Comparatives and Superlatives: A Case Study

Jean Mark Gawron
SRI International

1. Introduction

The central goal of this paper is to present a semantics of comparatives that deals uniformly with comparative ellipsis and superlatives. Consider (1):

(1) Jean_i gave her_i sister a more expensive book than Alice.

Understandings of the following types are possible:

1. **HER SISTER** focus: Jean gave Jean's sister a more expensive book than Jean gave Alice.
2. **JEAN** focus (strict): Jean gave Jean's sister a more expensive book than Alice gave Jean's sister.
3. **JEAN** focus (sloppy): Jean gave Jean's sister a more expensive book than Alice gave Alice's sister.

In each case, the NP which semantically parallels the NP in the *than*-phrase has been called the focus. I will refer to the NP in the *than*-phrase as the contrast. Now consider the variants in (2), which have analogous interpretations:

(2) Jean gave her sister the most/more expensive book.

1. **HER SISTER** focus: of all/both x's such that Jean gave x books, Jean gave Jean's sister the most/more expensive book.
2. **JEAN** focus (strict): of all/both x's such that x gave Jean's sister books, Jean gave Jean's sister the most/more expensive book.
3. **JEAN** focus (sloppy): of all/both x's such that x gave x's sister books, Jean gave Jean's sister the most/more expensive book.

I will use the term CONTRAST-SET to describe the set of entities whose properties are being measured and compared, a set which always includes the denotation of the focus. In the paraphrases above, the contrast-set is described by the *of*-phrase. I will call the nonelliptical focus constructions in (2) maximal-degree constructions (rather than superlative constructions) because they come with both comparative and superlative morphology. The only difference between the two is whether or not the contrast-set is presupposed to have two members.

Each of the three readings in (2) can be obtained from the corresponding reading of (1) simply by quantifying over the argument position filled by the contrast. Sentence (2) has another reading with no parallel in (1). This is the reading on which no givings are presupposed. There is simply a set of books available in the discourse, and Jean has given her sister the most expensive. I will refer to the minimal NP containing the comparative element as the COMPARATIVE NP in comparatives and the SUPERLATIVE NP in superlatives. For this reading, I will say that the superlative NP is the focus. One kind of elliptical comparative which makes a parallel comparison is shown in

(3) Jean gave her sister a more expensive book than *War and Peace*.

Here, too, only one giving event is at issue. What is being compared is the expense of the book in that giving event with the expense of *War and Peace*.

The basic conclusion I draw from (1), (2), and (3) is the following: for both constructions interpretations vary according to which NP is taken as focus. In effect, the same interpretive difficulties that arise in comparatives arise in maximal-degree constructions.

I will argue below that there is a striking similarity between the pattern of readings in (1) and (3) and a pattern typical of the interaction of focus and quantification. Consider, two different focus possibilities for (4):

(4) a. Most New Yorkers eat Chinese food with CHOPSTICKS.
b. Most New Yorkers eat CHINESE FOOD with chopsticks.

The two focus possibilities correspond roughly to the following readings:

(5) a. Most New Yorkers who eat Chinese food with something eat Chinese food with CHOPSTICKS.
b. Most New Yorkers who eat something with chopsticks eat CHINESE FOOD with chopsticks.

In each case the focus construction can be thought of as adding a restriction to the quantification. The restriction is obtained by abstracting the focus out of the main clause semantics and existentially quantifying it away. I will follow Jacobs 1991 by calling the property obtained by abstracting the focus out of the main clause semantics the BACKGROUND.

Consistent with a number of other analyses (beginning with Cresswell 1976), this treatment will interpret both comparatives and superlatives as a quantification over degrees; the various readings above are all obtained by restricting the comparative quantification with different backgrounds.

As remarked above, (2) has both superlative and comparative variants. Thus, comparative morphology is compatible with maximal-degree semantics. Some sentences are ambiguous. Consider:

(6) Who's taller?

Sentence (6) might be uttered in two different sorts of contexts:

(7) a. Their center is not the tallest member of the team. Who's taller?
b. John and Bill weigh the same. Who's taller?

In (a), the question is which member of the team under discussion is taller than the center. This is a discourse-bound comparative. In (b), the discourse provides a contrast-set and the question is who in that set has the maximum height. Since the set has cardinality two, the comparative form of the adjective is licensed. The second sentence in (b) might be replaced with any of the following:

(8) a. Of the two, who's taller?
b. Who's taller, John or Bill?
c. Is John or Bill taller?

All of these unambiguously call for a maximal-degree interpretation.

The comparative construction exhibits a bewildering range of elliptical phenomena. This paper is concerned with COMPARATIVE ELLIPSIS. I take it that all of the following are elliptical:

(9) a. John has met more presidents than Mary.
b. John has met more presidents than Mary has.
c. John has met more presidents than Mary has met.
d. John owns pictures of more presidents than Mary owns.
e. John owns more trucks than Mary does cars.

Sentence (9a) illustrates what I will call comparative ellipsis; (9b) illustrates the comparative construction interacting with verb-phrase ellipsis; (9c) illustrates the almost obligatory deletion of the head noun of the degree NP in the *than*-clause when it is identical with the head noun of the comparative NP; and (9d) illustrates what may be a more extreme version of the same thing. Sentence (9e) illustrates gapping in a comparative clause. Dealing with all these examples would be well beyond the scope of this paper.

Having stated the practical agenda for the paper, I will add that I do not foresee any problems of principle. The approach to both ellipsis and focus that I will adopt is from Dalrymple, Shieber, and Pereira 1991 (henceforth DSP), a paper which deals primarily with verb-phrase ellipsis.[1] The DSP framework shows promise of being a very general tool with which to approach phenomena of ellipsis. It seems likely that examples of the type exhibited in (9b) and (9c) do not present problems particular to comparatives. Sentences (9c) and (9d) do raise issues particular to comparatives, but the form of ellipsis shown there is largely orthogonal to the central issues of this paper. I emphasize sentences like (9a) because these are the examples that behave most like other focus constructions with regard to the scope-of-focus issues discussed in Section 2.1.

---

[1] Pulman 1991 also proposes applying the DSP framework to comparative ellipsis. The details of the analysis are different, but the approach is very much in the spirit of what is argued here.

I will distinguish between degree and quantity comparatives. Degree comparatives are adjectival or adverbial. Quantity comparatives involve number or amount:

Degree: John drove faster than Mary.
John was taller than Mary.
Quantity: John ate more apples than Mary.
John drank more wine than Mary.

Due to limitations of space, I will deal only with degree comparatives in this paper. There are some interesting issues involved in extending the account here to quantity comparatives, which show somewhat different ranges of readings of scope properties. For a fuller discussion, see Gawron 1992.

2. Parallels between Measure Constructions and *Only*

2.1. Scope of Ellipsis and Scope-Fixing

Consider first the ambiguity of a sentence like:

(10) John wants to own more records than Mary.

Sentence (10) can be paraphrased with either (11a) or (11b):

(11) a. Wide scope: John wants to own more records than Mary wants to own.
b. Narrow scope: John wants to own more records than Mary owns.

In the wide-scope reading, the comparison is between desires; in the narrow-scope reading, the comparison is between the number of records John owns and the number John owns, and John wants that comparison to work out a certain way.[2] As the paraphrases suggest, there is an ambiguity in how much missing material has to be reconstructed. Now consider a superlative example:

(12) John wants to own the most records.

Again, two readings are possible:

(13) a. John wants to own more records than anyone else wants to own.

---

[2] Paraphrase (b) here actually collapses two distinct *de re* and *de dicto* readings, but that does not affect the point under discussion.

b. John wants to own more records than anyone else owns.

There is a difference between (11) and (13) in these cases; the attachment of the *than*-phrase gives the comparative construction a syntactic way of *fixing* the scope of ellipsis. Consider the following:

(14) John wants to own more records than Mary by next year.

Sentence (14) has only a narrow-scope reading: what John wants is that by next year his collection is bigger than Mary's. A natural explanation is that the modifier *by November* most naturally attaches low, thus forcing low attachment of the *than*-phrase. Low attachment of the *than*-phrase means narrow scope-of-focus.

In light of this evidence, we propose Hypothesis A, to be revised later:

Hypothesis A

The sister of *than*-phrase is the scope-of-focus in comparative ellipsis.

The simple picture of comparative ellipsis is this: there is a relation between an individual and a measure and the measure-values of the relation are compared for the focus and the contrast. By the scope-of-focus in Hypothesis A, I mean the constituent whose semantics provides the relation being compared. In the wide-scope reading of (10), that constituent is the VP *wants to own more records*. In the narrow-scope reading, that constituent is the VP *own more records*.

In being governed by something like Hypothesis A, comparative ellipsis sentences with *than* resemble sentences with *only*. Scope-fixing effects with *only* are discussed in Taglicht 1984 and Rooth 1985:

(15) a. They were advised to only learn Spanish.
b. They were only advised to learn Spanish.

Here (a) has the reading on which advice is given to ignore languages other than Spanish; (b) has the reading on which the only advice given was to learn Spanish. The (a) sentence lacks the reading available for the (b) sentence, and vice versa. Thus, syntactic attachment of *only* fixes the scope of ellipsis, just as the syntactic attachment of the *than*-phrase does. The sentences in (15) are unambiguous only by a syntactic accident. The word *only* attaches verb-phrase initially so that it is clear which verb-phrase it has chosen; the *than*-phrase attaches verb-phrase finally, so that sentences like those in (13) may be ambiguous.

2.2. Entailments in Adjectival Comparatives

Noun phrases analogous to the following are noted in Bresnan 1973:

(16) a. A stronger man than John was found.
b. ?A stronger man than Mary was found.
c. A man stronger than John was found.
d. A man stronger than Mary was found.

One would like these facts to fall out from Hypothesis A. That is, all of the NPs in (16) are elliptical, and what they are elliptical for is determined by how much material is C-commanded by the *than*-phrase. Thus, one's account of ellipsis, guided by Hypothesis A, ought to give the NPs semantics roughly like the following:

(17) a. An m strong man such that [$m > s$ and John is an s strong man]
b.?An m strong man such that[$m > s$ and Mary is an s strong man]
c. A man m strong such that [$m > s$ and John is s strong]
d. A man m strong such that [$m > s$ and Mary is s strong]

An interesting property of these cases is that they appear related to some exceptions to Hypothesis A (discussed in Section 2.1). Consider:

(18) a. A more competent engineer than Bonnie was hired.

An m competent engineer such that [$m > s$ and Bonnie is an s competent engineer] was hired.

b. A more competent engineer was hired than Bonnie.

An m competent engineer was hired such that [$m > s$ and Bonnie, an s competent engineer, was hired].

A literal application of Hypothesis A would lead one to expect that these had something like the indicated paraphrases, but in fact sentences (a) and (b) do not appear to differ on their possible readings. Crucially, (b) has no entailment that Bonnie was hired. Contrast the sort of case which motivated Hypothesis A:

(19) BONNIE hired a more competent engineer than Frieda.

Here, if Bonnie is being compared to Frieda (that is, if *Bonnie* is the focus), then Frieda has to have hired a engineer.

We can sum up the facts from this section and Section 2.1 with the following observation:

Observation

(a) When the comparative NP is the focus, the syntactic scope-of-focus is the comparative N-bar.
(b) Otherwise the syntactic scope-of-focus is the surface sister of the *than*-phrase.

One might eliminate the disjunctive nature of this observation in either of two ways. First, one might assimilate (18b) to extraposition, and apply Hypothesis A only to the source. The drawback of this approach, it seems to me, is that it offers no explanation of the facts. Although an extraposition analysis will capture the actual reading of (18), it gives no account of why other readings aren't possible. To correctly constrain the readings, we will need to restrict *than*-phrases to N-bar attachment when the focus is the comparative NP. But this restrictions will be lifted when the focus is anything else. The other way to go is to look for a semantic explanation. This is what I will propose below.

3. Semantics of Comparatives

3.1. Subdeletion

To illustrate the approach to the semantics of comparatives taken here, it will be useful to start with a noncomparative example:

(20) This desk is six feet wide.

I will represent the semantics of degree adjectives as a relation between individuals and degrees:

(21) wide (that-table, [foot 6])

The term [foot6] denotes a measure in an ordered set of measures with the sort of structure discussed in Krifka 1987 and Nerbonne 1991. It is not crucial to the issues discussed in this paper that degree adjectives be relations between individuals and degrees, but it is crucial that the semantics of a simple measure assertion like (21) have in it terms that correspond to an individual being measured and a measure.

I will also assume that adjectival relations are downwardly monotonic on their measure arguments, so that if (21) is true then

(22) wide (that-table, [foot 5])

is also true. So the truth-conditions of (21) will only require that table to be at least 6 feet wide. One advantage of this downward monotonicity is that the semantics of *that table is wide* can just be:

(23) wide (that-table, STANDARD)

where STANDARD is some pragmatically fixed standard. The truth-conditions of (23) will then require that table to be at least as wide as the standard.

The kind of comparative that is easiest to understand semantically occurs relatively infrequently:

(24) This desk is longer than that table is wide.

I assume that (25) provides a satisfactory logical representation of (24):

(25) $\forall\, ?s\ [\text{wide}(\text{that-table}, ?s),$
$\quad\exists\, ?m\ [> (?m, ?s),$
$\qquad\text{long}(\text{this-desk}, ?m)]]$

Glossing the semantics: every degree s that is in the width relation to that table is such that there exists a degree m greater than s that stands in the length relation to this desk.

One reason for the universal quantification is the downward monotonicity of the adjective relation. We need to require this desk to have a length taller than all the widths of that table in order to be sure that the maximal width is included. There are other motivations for the universal quantification, however. One is that the *than*-phrase is a negative polarity context:

(26) John is smarter than any bureaucrat.

Another is the behavior of comparatives in modal contexts:

(27) John can run faster than Bill.

This sentence should come out true only if John can run faster than any speed Bill can run. To get this right, one would need universal quantification even if the adjective relations weren't downwardly monotonic.[3]

The central claim of this semantics is that the comparative construction introduces a quantifier on measures restricted by the material in the *than* phrase.[4]

I will assume that each measure set has an ordering relation on measures which I will notate simply as $>$, and that comparatives use $>$. I will call the measure constrained by the main clause the STANDARD and the measure constrained by the *than*-clause the REFERENCE.

3.1. Comparative Ellipsis

We now turn to cases involving ellipsis. We begin with a brief summary of the framework of DSP, using a verb phrase ellipsis example:

---

[3] Thanks to Bob Moore for pointing this example out.

[4] I will refer to the second-order property obtained by abstracting on ψ in:

$$\forall s\,[\ \phi(s),$$
$$\quad\exists m[> (m, s), \psi(m)]]$$

as the comparative quantifier; thus, ψ stands as the comparative quantifier's scope. Of course, there are really two quantifiers here, and they can scope independently, but for most of the examples under consideration that possibility is not germane to the discussion. This paper has little to say about constraints on the scoping possibilities of the comparative quantifier.

(28) a. Bill washed his car and John did too.
b. AND[wash(b,car(b)), P(j)]

Given the semantics in (b), the problem of interpreting (a) now reduces to the problem of solving for the unspecified property P. In DSP, resolving that property involves the following steps.

1. Locate source: wash(b,car(b)).
2. Establish parallel elements and locate *primary occurrences* in source.

   wash ($\underline{\mathrm{b}}$, car(b))

   Parallel elements are constituents in a tree. Primary occurrences are terms in the semantic form. A primary occurrence in the source is a term actually contributed by a parallel element. Thus, the two subjects are parallel in (28a), and the first occurrence of b above is primary because it is contributed by the subject NP in the source. The second is not because it is contributed by a pronoun which is not a parallel element.

3. Set up equation.

   $P(\mathrm{b}) = \mathrm{wash}\,(\underline{\mathrm{b}}, \mathrm{car}(\mathrm{b}))$

4. Solve equation.

   Strict: $P = \lambda x[\mathrm{wash}\,(x, \mathrm{car}(\mathrm{b}))]$
   Sloppy: $P = \lambda x[\mathrm{wash}\,(x, \mathrm{car}(x))]$
   $P = \lambda x[\mathrm{wash}\,(\underline{\mathrm{b}}, \mathrm{car}(x))]$
   $P = \lambda x[\mathrm{wash}\,(\underline{\mathrm{b}}, \mathrm{car}(\mathrm{b}))]$

5. Discard UNACCEPTABLE SOLUTIONS, that is, solutions which contain a primary occurrence. DSP reject certain solutions that violate parallelism in that they do not abstract over a primary occurrence. In this case the single primary occurrence is the occurrence of **b** filling the first argument role of *wash*. Thus, the third and fourth solutions above are unacceptable.

We now turn to cases of comparative ellipsis:

(29) Jean gave her sister a more expensive book than Alice.

The semantics is

(30)
$$\begin{array}{l}
\exists y\ [\forall s\ [\mathrm{R}(\mathrm{a},\ s), \\
\qquad \exists m\ \ [>(m,\ s), \\
\qquad\qquad \mathrm{AND}[\ \mathrm{book}(y), \\
\qquad\qquad\qquad \mathrm{expensive}(y,\ m)]]], \\
\qquad \mathrm{give}(\ \mathrm{j}\ ,\ \mathrm{sister}(\mathrm{j})\ ,\ y)]
\end{array}$$

The idea here is that what the *than*-phrase contributes is just a relation between an individual and a measure:

$$R(\mathrm{a},\ s)$$

Note that is not meant to commit the syntax in any way to an empty measure element.

On the approach to the semantics of comparatives we have adopted, the *than*-phrase always introduces a proposition which restricts the comparative quantifier, whether or not the sentence is elliptical. In the elliptical sentences all we have restricting the quantifier is an unspecified relation between an individual and a degree. The problem of interpreting the elliptical sentences now reduces to the problem of resolving the relation R. We will resolve the relation by abtracting elements out of the semantics of the main clause. Thus we have a paradigm case of the interaction of focus and quantification as discussed in section 1. A relation is being contributed by the semantics of the main clause (this is what corresponds to the background of Jacobs 1991), and that relation restricts the domain of quantification.

In the framework of DSP, solving for R means setting up a second-order equation on the basis of parallelisms between the elliptical semantics and some template semantics. The steps are as follows:

1. Locate scope-of-focus. We will use the term scope-of-focus rather than source because, as illustrated in section 2.1, there are ambiguities in comparative ellipsis that can be captured only if the amount of material omitted in the ellipsis is allowed to vary. In this case, the template on which the elliptical clause will be built is just the semantics of the main clause minus the comparative quantifier. That the comparative quantifier must always be abstracted out before setting up equations is just a stipulation about degree constructions (the account of maximal-degree constructions will entail the same move):

   (31)
   $$\begin{array}{l}
   \exists y[\mathrm{AND}[\mathrm{book}(y), \\
   \qquad\qquad \mathrm{expensive}(y,\ m)], \\
   \qquad \mathrm{give}(\ \mathrm{j}\ ,\ \mathrm{sister}(\mathrm{j})\ ,\ y)]]]
   \end{array}$$

2. Establish parallel elements and locate primary occurrences in source. In comparative ellipsis, there are two parallelisms to worry about. One will

be established simply by locating parallel elements in a syntactic tree. This is the parallelism of the focus and contrast. The other parallelism is that between the standard measure and the reference measure. Not wishing to adopt an abstract syntactic analysis for these cases, I will simply assume that parallelism of degrees is given by the construction. Thus, the unique occurrence of the standard in (31) will be a primary occurrence. Let us consider the case where *Jean* is focus.

Main Clause:	JEAN	gave her sister an	m expensive book
	Focus		Standard
Than Clause:	Alice		s
	Contrast		Reference

3. Set up and solve equations.

$$
\begin{array}{lrl}
(32) & \text{JEAN as focus:} & R(\mathrm{j}, m) = \exists\, y[\textsc{and}[\mathrm{book}(y), \\
& & \qquad \mathrm{expensive}(y, \underline{m})], \\
& & \qquad \mathrm{give}(\mathrm{j}, \ \mathrm{sister}(\mathrm{j}), \ y)] \\
& \text{Strict:} & R = \lambda x, z\, [\exists\, y[\textsc{and}[\mathrm{book}(y), \\
& & \qquad \mathrm{expensive}(y, z)], \\
& & \qquad \mathrm{give}(x, \ \mathrm{sister}(\mathrm{j}), \ y)]] \\
& \text{Sloppy:} & R = \lambda x, z\, [\exists\, y[\textsc{and}[\mathrm{book}(y), \\
& & \qquad \mathrm{expensive}(y, z)], \\
& & \qquad \mathrm{give}(x, \ \mathrm{sister}(x), \ y)]]
\end{array}
$$

Substituting the acceptable solutions for R in (30) yields the desired result.

4. Discard unacceptable solutions. Again these are just the solutions that have primary occurrences in them. There are five unacceptable solutions in all, two which fail only in leaving behind the primary occurrence of the focus, two which fail in leaving behind both primary occurrences, and one which fails in leaving behind the primary occurrence of the standard. Here are two of them:

$$
\begin{array}{ll}
(33) & R = \lambda x, z\, \exists\, y[\textsc{and}[\mathrm{book}(y), \\
& \qquad \mathrm{expensive}(y, z)], \\
& \qquad \mathrm{give}(\mathrm{j}, \ \mathrm{sister}(x), \ y)]]
\end{array}
$$

$$
\begin{array}{ll}
(34) & R = \lambda x, w\, \exists\, y[\textsc{and}[\mathrm{book}(y), \\
& \qquad \mathrm{expensive}(y, z)], \\
& \qquad \mathrm{give}(\mathrm{j}, \ \mathrm{sister}(x), \ y)]]
\end{array}
$$

> The first of these would give the impossible reading: *Jean gave Jean's sister a more expensive book than Jean gave Alice's sister.* The second is just vacuous abstraction on both argument positions and would give the contradictory reading that Jean gave her sister a more expensive book than Jean gave her sister. The reader may verify that the other three unacceptable solutions all give impossible readings.

The other reading to deal with is the case where *her sister* is the focus. In this case the equation is:

(35)

$$\begin{aligned} \text{HER SISTER:}\quad R(\text{sister(j)}, m) &= \exists\, y[\textsc{and}[\text{book}(\ y).\\ &\qquad\qquad \text{expensive}(\ y.\ m)].\\ &\qquad \text{give}(\ \text{j}.\ \underline{\text{sister(j)}}.\ y)]\\ R &= \lambda x, z\,[\exists\, y[\textsc{and}[\text{book}(\ y).\\ &\qquad\qquad \text{expensive}(\ y.\ z)].\\ &\qquad \text{give}(\ \text{j}.\ x.\ y)]] \end{aligned}$$

In this case there is only one acceptable solution because there is only one primary occurrence for each argument of the relation. There are three unacceptable solutions, one which leaves behind just the primary occurrence of the focus, one which leaves behind just the primary occurrence of the standard, and one with vacuous abstraction on both argument positions of R, which leaves behind both.

We turn now to the other example of comparative ellipsis discussed in Section 1:

(36) Jean gave her sister a more expensive book than *War and Peace*.

The semantics is:

(37)

$$\begin{aligned} &\exists\, y\ [\forall\, s\ [\text{R (War-and-Peace}.\ s).\\ &\qquad\qquad \exists\, m\ \ [>(\ m,\ s),\\ &\qquad\qquad\qquad \textsc{and}[\ \text{book}(\ y).\\ &\qquad\qquad\qquad\qquad \text{expensive}(\ y.\ m)]]].\\ &\qquad \text{give}(\ \text{j}\ .\ \ \text{sister(j)}\ .\ y)] \end{aligned}$$

The equations for this scope-of-focus are:

(38)

$$\begin{aligned} R(y, m) &= \textsc{and}[\ \text{book}(\ y).\\ &\qquad\quad \text{expensive}(\ y.\ m)]\\ R &= \lambda x, z\,[\textsc{and}[\ \text{book}(\ x)\\ &\qquad\quad \text{expensive}(\ x.\ z)]] \end{aligned}$$

Since R is applied to *War and Peace*, the sentence will be true only if *War and Peace* is a book. This, then, is one step in accounting for the entailment facts noted in Bresnan 1973 and discussed in Section 2.2. We still need to explain why this is the correct scope-of-focus for those examples, however.

In this case the head noun and the adjective predications must both contain primary occurrences. Among the unacceptable solutions, there are two ruled out simply because they do not abstract over one of the two primary occurrences of y:

(39)
$$\begin{aligned} R = \lambda x, z\, [\textsc{and}[\ & \text{book}(\ y), \\ & \text{expensive}(\ x,\ z)]] \\ R = \lambda x, z\, [\textsc{and}[\ & \text{book}(\ x) \\ & \text{expensive}(\ y,\ z)]] \end{aligned}$$

The first reading would not preserve the entailment that *War and Peace* is a book (see Section 2.2). The second would contradictorily require that y be more expensive than itself.

In calling both occurrences of y primary occurrences here, we are building on the sense of primary occurrence as it is assumed in DSP. The motivation for this move is the following: the two occurrences of y in the equations in (39) differ from the two occurrences of j in (32) in that the grammar always requires the two occurrences of y to be identified. An adjective modifying a noun always has its theme argument identified with the noun's. One may think of the semantics of the N-bar as being:

$$[\text{book} \wedge \lambda x[\text{expensive}(\ x,\ z)]\ ](w)$$

Here $\wedge$ represents property conjunction. From this perspective there is really only one primary occurrence of the N-bar variable. What is going on here is reminiscent of other cases where the grammar requires identification of two variables, such as the cases of obligatorily sloppy pronouns in Serbo-Croatian discussed in DSP. A more familiar case would be the cases of obligatory sloppy readings with raising verbs such as *expect* in

(40) John expects to leave and Bill does too.

Here there is no reading on which Bill expects John to leave. Yet there is good motivation for believing that *expect* takes a proposition argument, and that the semantics of the source clause is

(41) expect(j,leave(j))

Blocking the strict reading would entail hypothesizing two primary occurrences.

We have now worked through the semantics of two closely related elliptical examples, arguing that the principal difference between them is a difference in the scope-of-ellipsis. It should be clear from these examples that any hopes this analysis may have in being explanatory lie in being able to give a principled account of how the scope-of-focus is determined. Consider again the semantics shown in (30). What would have happened if we had chosen the scope-of-focus in (31) with the comparative NP as the focus? The reading predicted then would have been incorrect:

(42) Jean gave her sister an m expensive book and Jean gave her sister *War and Peace*, an s expensive book, and m was bigger than s.

This is essentially the same fact we noted for (18).

I will now argue that for semantic reasons the maximal scope-of-focus when the comparative NP is focus is the N-bar. Consider (37). There are four cases to look at:

1. Nbar scope: okay.
2. The scope-of-focus is the scope of the indefinite.

   $$R(y, m) = \text{give}(\text{j}, \text{sister}(\text{j}), y),$$

   Here there is no occurrence of m on the right-hand side of the equation. Therefore, this equation has no solution that does not involve vacuous abstraction.
3. The scope-of-focus is the sentence with indefinite quantified in and r is a first-order relation. The equation then is

   $$\begin{aligned} R(y, m) = \exists\, y[\textsc{and}[&\text{book}(y), \\ &\text{expensive}(y, m)], \\ &\text{give}(\text{j}, \text{sister}(\text{j}), y)]] \end{aligned}$$

   The problem with this equation is that there is no occurrence of y, the focus, on the right-hand side. Since the quantifier has been quantified in, any y on the right hand side is a bound variable and no solution can abstract over it. Again, the equation has no solutions which do not involve vacuous abstraction.
4. The scope-of-focus is the sentence with indefinite quantified. R is a higher-order relation. The system in DSP allows type-lifting in order to deal with cases where one or both of the parallel elements is a quantifier. Thus, in analyzing:

   Every student revised his paper, and John did too.

John can be made parallel to *Every student* by type-lifting. On this account (36), *War and Peace* is parallel not to an individual-level variable, but to the indefinite quantifier, *a more expensive book*. It is thus type-lifted to be a quantifier:

$$\lambda P[P(\text{War-and-Peace})]$$

and R is correspondingly type-lifted to allow a quantifier to be one of its arguments. The resulting equation is

$$\mathrm{R}\left(\begin{array}{l}\lambda P[\exists\, y\, [\textsc{and}[\ \text{book}(\,y\,), \\ \qquad\qquad\qquad \text{expensive}(\,y,\ m\,)] \\ \qquad\qquad P(y)]]\end{array}\quad ,\, m\right) = \exists y \left[\begin{array}{l}\textsc{and}[\,\text{book}(\,y\,), \\ \qquad \text{expensive}(\,y,\ m\,)], \\ \text{give}(\ \text{j}\ ,\ \ \text{sister(j)}\ ,\ y\,)\end{array}\right]$$

But this, too, has no solutions which do not involve vacuous abstraction. In this case no solution can simultaneously abstract over the focus quantifier and m the standard. Two of the solutions are

$$\begin{array}{l}\mathrm{R} = \lambda\mathcal{P}, z[\mathcal{P}(\lambda y[\text{give}(\ \text{j}\ ,\ \ \text{sister(j)}\ ,\ y\,)]\,)] \\ \mathrm{R} = \lambda\mathcal{P}, z[\exists\, y[\textsc{and}[\,\text{book}(\,y\,), \\ \qquad\qquad\qquad\qquad \text{expensive}(\,y,\ z\,)], \\ \qquad\qquad\quad \text{give}(\ \text{j}\ ,\ \ \text{sister(j)}\ ,\ y\,)]]\end{array}$$

There is also a solution which vacuously abstracts over both argument positions.

If we could eliminate all the equations that have only vacuous solutions, then we would have an account of why the N-bar is the only scope-of-focus in this case. Careful readers of DSP will note that they posit no restriction against vacuous solutions. Instead, unacceptable solutions are characterized as those which still contain a primary occurrence. This rules out many cases of vacuous abstraction, but it also rules out solutions such as (33). Rather than try to modify this characterization, I want to suggest that there is an independent restriction, not on solutions, but on equations, which rules out those that have no nonvacuous solutions. This restriction should be thought of as an adjunct to the algorithm for finding a source and parallel elements and setting up an equation. An equation which has no nonvacuous solutions is simply one for which no true parallelisms have been found.

We can now revise Hypothesis A of Section 2.1 and propose a semantic account of the scope-of-focus facts observed in (18):

Hypothesis A: Final Version

The syntactic scope-of-focus is the maximal constituent of the surface sister of the *than*-phrase whose semantics can provide a scope-of-focus with acceptable ellipsis equations.

Note that with this hypothesis, we have an account of the adjectival entailment facts noted in Bresnan 1973 and discussed in section 2.2

(43) ? A stronger man than Mary was found.

The widest scope-of-focus that yields an acceptable equation is the N-bar. There is one narrower scope-of-focus than that N-bar that yields equations with acceptable solutions, namely, the semantics of the adjective:

(44) strong(y, m)

But Hypothesis A, on syntactic grounds, rules out choosing this as the scope-of-focus for (43). It follows from this that any equations resolving the ellipsis will have to include the noun predication in their solutions for R. Thus, any solutions will entail that Mary is a man.

3.2. Maximal-Degree Consturctions

We begin by presenting the semantics for (2), reproduced here:

(45) Jean gave her sister the most expensive book.

The semantics, irrespective of what the focus i,s is

$$
(46)\quad \begin{array}{l}
\text{the } y\ [\forall s\ [\exists x[\mathrm{C}(x),\ \mathrm{R}(x,\ s)], \\
\qquad\qquad \exists m\ \ [\geq(m,\ s), \\
\qquad\qquad\qquad \text{AND}[\ \text{book}(y), \\
\qquad\qquad\qquad\qquad \text{expensive}(y,\ m)]]], \\
\qquad \text{give}(\ \text{j}\ ,\ \ \text{sister(j)}\ ,\ y)]
\end{array}
$$

There are several differences here from the semantics of a comparative ellipsis sentence. First, the position filled by the contrast in the *than*-phrase has been existentially quantified over, with that quantification restricted to the members of a contrast-set C. Under the scope of ∀, this has the effect of a universal quantification. Second, the ordering relation has been changed from $>$ to $\geq$. This is because the focus is in the contrast-set too, and if the sentence is ever to be uttered truthfully, ties with the highest scoring element of the contrast set must be allowed.[5]

One might argue for the inclusion of the contrast-set C in (46) on the basis of a general requirement that all quantification should be contextually restricted. But independently of that there is a specific motivation for making it explicit in the semantics of superlatives. Sometimes the contrast-set can be associated with syntactically overt material:

---

[5] The only difference in the semantics of *Jean gave her sister the more expensive book* is that instead of quantifying over the contrast-set with ∃ we quantify with (∃; 2).

(47) a. Of the three sisters, Jean bought the most expensive book.
b. Which sister bought the most expensive book?

Thus, (47a) is appropriate only when JEAN is the focus, and the set of buyers Jean will be compared to is the set of the three sisters in question, which must include Jean. In (47b), on what is probably the most accessible reading, the contrast-set is identified with the restriction-set of the *wh*-phrase.

The equations for the case when *Jean* is focus and for the case when *her sister* is focus are exactly as they were for the comparative analogue discussed in Section 3.2, as are the solutions. As was noted in Section 1.1, sentence (46) has another focus possibility, parallel not to (29) but to (36). In this case the focus is the superlative NP. The equation for this reading is exactly the same as the equation for (36), given in (38).

Another difference between the superlatives and the comparatives is that no version of Hypothesis A applies to the superlatives, since they have no *than*-phrase. Thus, nothing prevents a reading in which the scope of focus is narrower than N-bar when the focus is the superlative NP:

(48) Of the three items the clerk showed, Jean bought the most expensive ring.

Here the items need not be all rings. The scope-of-focus must be the adjective-phrase alone:[6]

4. Conclusion

In this paper I have proposed an analysis of measure constructions that provides a uniform semantics for comparative ellipsis and superlatives, arguing that both can be regarded as examples of focus constructions. The specialness of comparatives ellipsis consists in requiring a contrast along with a focus.

The analysis proposes an account of the entailments of degree comparatives in which the comparative NP is the focus. Thus,

(49) A stronger man than Bill was found.

entails that Bill was a man. This is accounted for by the relationship between the scope-of-focus and the *than*-phrase.

I conclude with an effort to show that the equational machinery of DSP does extend neatly to handle a paradigm case of a focus construction. The following is a reworking of the analysis of *only* in Rooth 1985:

(50) John only introduced Sue to her brother.

---

[6] Thanks to Carl Pollard for pointing this reading out.

(51) $\forall p[\,\exists x\,[\,\mathrm{A}(x), \textsc{and}[{}^{\vee}p, (\mathrm{P}(x) = p)]\,],$
$\quad (p = \text{ introduce(j, brother(s), s)}\,)\,]$

SUE: $P(\mathrm{s}) = [\text{introduce(j, brother(s), s)}]$
$P = \lambda y\,[\text{introduce(j, brother}(y), y)]$
$P = \lambda y\,[\text{introduce(j, brother(s)}, y)]$

HER BROTHER: $P(\text{brother(s)}) = [\text{introduce(j, brother(s), s)}]$
$P = \lambda y\,[\text{introduce(j}, y, s)]$

The resemblance of the proposed semantics to the semantics of maximal measure constructions is striking. Instead of a universal quantification over measures, there is a universal quantification over propositions. Most interestingly, in both cases, the restriction of the universal requires an existential quantification over a pragmatically given set. In the case of comparatives, I have called that the contrast-set; Rooth calls A the alternative-set, characterizing the members of A as the alternatives to the focus in the discourse. In the case where *her brother* was focus, Rooth 1985 would associate two things with (50):

(52) a. $\forall p[\mathrm{C}(p) \wedge {}^{\vee}p \longrightarrow p = \text{introduce(j, brother(s), s)}]$
b. $\lambda p \exists y[[\mathrm{A}(y)] \wedge p = \text{introduce(j}, y, \text{s)}]$

The first is roughly the semantics of the sentence, independent of what the focus is; the second is the p-set (or presupposition set) that goes with having *her brother* as focus. The p-set property in (52b) is then identified with the property of propositions C in (52a). In the recasting given in (51) predicating C of p has been replaced by predicating property P of any individual x and requiring proposition p to be equal to the resulting proposition. The equations solving for P are then set up depending on what has been chosen as the focus. In effect, the task of recursively building up p-sets in parallel with the main semantics is being taken over by the equation-solving machinery. Rooth's idea that one component of the semantics should be kept independent of what the focus is has been preserved. In fact, that property has been preserved throughout this paper: the semantics independently of a solved equation is always compatible with any focus in the scope-of-focus.

Rooth's approach shares with that of Jacobs 1991 the idea that an account of focus requires recourse to some two-component account of meaning. In Rooth it is the main translation and the p-set; in Jacobs it is the focus and the background. One interesting feature of the equational approach is that it tries to make do with a single meaning component, which can then generate a variety of restrictions on the quantifications of focus operators.

Acknowledgment

I owe the basic skeleton over which this paper has been hung to Carl Pollard's unpublished work on the syntax and semantics of comparatives, and much of my thinking on the semantics of measure and quantification with measures to discussions with John Nerbonne. The analysis of comparatives implemented in the HPNL system at Hewlett-Packard Labs was the combined effort of a number of people, all of whom at various times help me understand what was going on. They included Dan Flickinger, David Goddeau, Masayo Iida, Bill Ladusaw, and Lyn Walker. Discussions with Mary Dalrymple have had an obvious effect on my views on ellipsis, as have more recent discussions with her co-authors Stuart Shieber and Fernando Pereira. More recently, collaborating with Bob Moore at SRI on an implementation of an analysis of comparatives in the Gemini system, has changed my views on the comparative quantifier.

This research was supported by the Defense Advanced Research Projects Agency under Contract ONR N00014-90-C-0085 with the Office of Naval Research. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Defense Advanced Research Projects Agency of the U.S. Government.

References

Barwise, J. and Cooper, R. 1981. Generalized Quantifiers and Natural Language. *Linguistics and Philosophy* 4(2):159-219.

Bresnan, J. 1973. Syntax of the Comparative Clause Construction in English. *Linguistic Inquiry* 4(2):275-343.

Cresswell, M.J. 1976. The Semantics of Degree. In B. Partee (ed). *Montague Grammar.* Academic Press, New York.

Dalrymple, M.,Shieber,S., and Pereira,F. 1991. Ellipsis and Higher-Order Unification. *Linguistics and Philosophy* 14:399-452.

Evans, G. 1977. Pronouns, Quantifiers, and Relative Clauses. *Canadian Journal of Philosophy* 7:467-536.

Gawron, J.M. 1992. Comparatives, Superlatives, and Focus. Manuscript. SRI, International.

Geach,P. 1962. *Reference and Generality.* Cornell University Press, Ithaca.

Jacobs, J. 1991. Focus Ambiguities. *Journal of Semantics* 8: 1-16.

Klein, Ewan. 1980. The Interpretation of Adjectival Comparatives. *Journal of Linguistics* 18:1-45.

Krifka, M. 1987. Nominal Reference and Temporal Constitution: Towards a Semantics of Quantity. Technical Report 17, Forschungsstele fur natursprachliche Systeme, Universitat Turbingen.

Link, G. 1983. The Logical Analysis of Plurals and Mass Terms: A Lattice-Theoretical Approach. In R. Bauerle, U. Egli, and A. cvon Stechow (eds).

Meaning, Use and the Interpretation of Language. de Gruyter, Berlin.

Nerbonne, J. 1991. Nominal Comparatives and Generalized Quantifiers. Manuscript. DFKI, Saarbrucken.

Pulman, S. 1991. Comparatives and Ellipsis. Proceedings of European ACL.

Rayner, M. and A. Banks. 1990. An Implementable Semantics for Comparative Constructions. *Computational Linguistics* 16: 86-112.

Rooth, M. 1985. Association with Focus. Ph.D. Dissertation, University of Massachusetts at Amherst.

Sag, I. *Deletion and Logical Form*. Ph.D. Dissertation, Massachusetts Institute of Technology.

Taglicht, J. 1984. *Message and Emphasis*. Longman, New York.

von Stechow, A. 1984. Comparing Semantic Theories of Comparison. *Journal of Semantics*, 3: 1-77.

A Note on Interrogatives and Adverbs of Quantification

Jeroen Groenendijk & Martin Stokhof
ILLC/Department of Philosophy
University of Amsterdam*

1. Introduction.

This paper is about a topic in the semantics of interrogatives. In what follows a number of assumptions figure at the background which, though intuitively appealing, have not gone unchallenged, and it seems therefore only fair to draw the reader's attention to them at the outset.

The first assumption concerns a very global intuition about the kind of semantic objects that we associate with interrogatives. The intuition is that there is an intimate relationship between interrogatives and their answers: an interrogative determines what counts as an answer.** Given a certain, independently motivated, view on what constitutes the meaning of an answer, this intuition, in return, determines what constitutes the meaning of an interrogative. For example, starting from the observation that answers are true or false in situations, we may be led to the view that answers express propositions, i.e., objects which determine a truth value in a situation. Given that much, our basic intuition says that interrogatives are to be associated with objects which determine propositions. Such objects will be referred to as 'questions' in what follows. Notice that all this is largely framework independent: we have made no assumptions yet about what situations, propositions, and questions are, we have only related them in a certain systematic way. In fact we will use a more or less standard, but certainly not uncontroversial, specification in what follows: situations are identified with (total) possible worlds; propositions with sets of worlds; and questions with equivalence relations on the set of worlds.

The second assumption that plays a role in what follows is of a more linguistic nature. Interrogatives typically occur in two ways: as independent expressions, and as complements of certain verbs. The assumption is that these two ways of occurring are systematically related, not just

---

* The preparation of this paper was supported by the Esprit Basic Research Action DYANA. We would like to thank Craige Roberts for her helpful comments.

** This intuition is what Belnap (in Belnap 1981) calls the 'answerhood thesis'.

syntactically but also semantically.* Notice that the exact nature of this relationship is underdetermined by this assumption: the most strict specification would require an interrogative to have the same meaning when occurring independently and embedded, but weaker specifications would also satisfy this requirement. The strict view combined with the previous assumption entails that both embedded and independent interrogatives express questions, and that verbs embedding interrogatives express relations to questions. Such relations may be of various kinds: a verb may express a relation to the question as such, in which case we call it 'intensional', or it may express a relation to the proposition which is the value of the question in the actual world, in which case it is labelled 'extensional'.

The third assumption that plays a role in what follows is of a more methodological nature. It concerns the way in which a semantic analysis deals with the general, 'cross-categorial' phenomena of coordination and entailment. Roughly the assumption is that coordination and entailment are cross-categorial not only in a syntactic sense, but also semantically: a semantics of coordination and entailment which is general in the sense of being specified independently of the category/type of expressions involved is to be preferred to one which is defined for each category/type of expressions separately. Again, this assumption is to a large extent framework independent. Within the classical intensional typetheoretic framework that we will employ in what follows we will assume that coordination is defined point-wise by the standard boolean connectives, and that entailment is defined as meaning inclusion.**

It is interesting to note that if we combine this third assumption with the kind of analysis that emerges from what we said above, certain predictions result concerning entailment relations between interrogatives. Given our first assumption the meaning of an interrogative is an object which determines in a situation what counts as an answer. Given that entailment is meaning inclusion, an interrogative I entails another interrogative I' iff every answer to I is an answer to I'. This seems to be an intuitively acceptable result: asking a question involves asking another one if the latter is answered if the former is.

This gives a rough sketch of the contours of the space within which a reasonable semantics for interrogatives is to be found, but in order to appreciate the problems that we are interested in, we have to be a little more specific about what we take the basic semantics of interrogatives to be. As we indicated above, we assume that an interrogative expresses an equivalence relation between worlds. What is this equivalence relation? Roughly speaking it is the relation of being extensionally the same with respect to some relation. Concretely, an interrogative is based on a relational expression: it expresses an inquiry about the extension of a relation. A sentential interrogative can be viewed as based on a zero-place relation, i.e., a sentence, and thus expresses an inquiry about a truth value. The worlds which are indistinguishable with respect to the extension of a certain relation together make up a proposition, which can be identified with the proposition expressed by an answer to the corresponding interrogative. Such a proposition gives an exhaustive specification of the positive extension of the relation involved. Notice that it follows that in each world the question expressed by an interrogative determines exactly one proposition: the complete true answer to the interrogative. In section 2 we will outline how this view can be implemented, now we turn to some observations that seem to be at odds with this analysis.

---

* Belnap (op. cit.) calls this the 'independent meaning thesis'. It can be viewed as a special instance of the principle of compositionality, given a certain rather natural view on the syntactic status of embedded interrogatives.

** The empirical problems with this claim, for example those concerning non-boolean coordination and free choice permission, are not relevant for the issues discussed in this paper.

In his dissertation Stephen Berman* has argued that *wh*-terms like *which student(s)* in many ways behave like indefinite terms such as *a student/students*. Berman's main argument concerns their behavior under adverbs of quantification, as in the following example:

(1) The principal usually finds out which students cheat on the final exam.

According to Berman, this sentence has two readings. Besides the reading paraphrased in (2), there is also a reading that can be paraphrased as in (3):

(2) In most (final exam) situations the principal finds out which students cheat in that situation.

(3) Of most students who cheat on the final exam the principal finds out that they cheat on the final exam.

Berman convincingly argues that these two readings of (1) are different. Suppose that in each of the (final exam) situations the principal catches 75 percent of the cheaters, then on paraphrase (2), sentence (1) would be true, but on the reading paraphrased by (3), sentence (1) would be false. For (2) to be true, it should be the case that for most of the (final exam) situations the principal catches all cheating students.

This is taken to indicate that a *wh*-term like *which student* does not contain a quantifier by itself, but gets its quantificational force from an adverb of quantification, much in the same way as this has been argued to be the case for indefinites as in (4):

---

* Berman (1991). See also Berman (1990).

(4) If a student cheats on the final exam then the principal usually finds out that he does.

Of course the adverb of quantification may be implicit, in which case it is supposed to have universal quantificational force. On this assumption Berman gets the interpretation paraphrased in (6) for a sentence like (5):

(5) The principal found out which students cheated on the final exam.

(6) For all students who cheated on the final exam the principal found out of them that they cheated on the final exam.

This paraphrase of the meaning of (5) is not quite what one would expect assuming the kind of semantics outlined above. Recall that on that approach questions are strongly exhaustive in the following sense: a question determines in a possible world a unique proposition, one which gives a complete specification of the positive extension in that world of the relation involved. It is precisely this aspect of strong exhaustiveness that is lacking from the semantic interpretation that Berman assigns to the embedded interrogative in (5). For it is clear that (6) is compatible with it being the case that the principal accuses a number of non-cheaters of having cheated. But in the analysis outlined earlier the proposition which the question expressed by the embedded interrogative determines in the actual world, and to which the principal stands in the relation of having found out, is strongly exhaustive. Hence on that analysis the principal should not accuse non-cheaters, if (5) is to be true.

Of course the same holds for sentence (1) and Berman's paraphrase (3). Clearly (1) entails (3), but it is not entailed by (3): if the principal indeed found out about most cheaters that they cheated, but also accused more than just a few non-cheaters of having cheated, then whereas (1) would be false according to the strong exhaustiveness approach, its proposed paraphrase is not.

Berman's paraphrases represent a different view on answers, and consequently, on the meaning of interrogatives. According to this view the answer to an interrogative need only be weakly exhaustive. The difference with the strongly exhaustive approach is most easily explained in terms of question-answer pairs. Consider the following example:

(7) Which girls are asleep?
—Mary, Suzy and Jane (are asleep).

According to the weakly exhaustive view, the answer in (7) means simply that Mary, Suzy and Jane are girls that are asleep. According to the strongly exhaustive view it means that Mary, Suzy and Jane are the girls that are asleep, i.e., it says that only Mary, Suzy and Jane are girls that are asleep. In other words, the two views differ with respect to what proposition counts as the true answer to the question which girls are asleep, and hence to what is the meaning of the interrogative.

Different views on what constitutes the meaning of an interrogative lead to different predictions regarding the logical properties of (embedded) interrogatives. Let us give one simple illustration. We saw above that given the standard analysis of entailment as meaning inclusion, and given the general characterization of the meaning of interrogatives in terms of their answerhood conditions, an interrogative I entails an interrogative I' iff whenever a propositions p gives a true answer to I, p gives a true answer to I' as well. If we combine this with strong exhaustiveness we predict that the interrogative in (7) entails (8) (assuming that we know that Claire is a girl):

(8) Is Claire asleep?

But under weak exhaustiveness this does not follow. If only Mary, Suzy and Jane are asleep, the interrogative in (7) would denote the proposition that they are asleep, but that does not entail that Claire is not asleep, which in that situation would be the true answer to (8). Similarly, strong exhaustiveness predicts that (9):

(9) John knows which girls are asleep.

entails (10):

(10) John knows whether Claire is asleep.

But weak exhaustiveness makes (9) compatible with John believing that Claire is asleep, in case she is not, and still know which girls are asleep.

In various places[*] we have argued that the strongly exhaustive interpretation of interrogatives is the basic one. In our opinion, predictions such as the ones illustrated above constitute arguments in favour of this position. Other arguments can be added. To indicate just one, suppose Hilary wants to find out which girls are asleep. She asks Peter, who replies that he doesn't know, but adds that John does. Now suppose, as we did above, that John believes that Mary, Suzy, Jane and Claire are asleep, whereas in fact only the first three of them are. Asked by Hilary which girls are asleep, John answers that Mary, Suzy, Jane and Claire are. Suppose furether that Hilary subsequently finds out that Claire isn't asleep. Would she not quite rightly claim that the answer she got from John was wrong, that in fact he did not know which girls were asleep, and that Peter was wrong in claiming that he did?

---

[*] See Groenendijk & Stokhof (1982,1984).

Another difference between the weak and strong exhaustiveness views shows up when we consider other embedding verbs such as *wonder*. Berman observes that if we replace the verb *find out* in (1) by the verb *wonder* the result is a sentence which has one reading less:

(11) The principal usually wonders which students cheat on the final exam.

This sentence can only be paraphrased, Berman notes, as in (12):

(12) In most (final exam) situations, the principal wonders which students cheat in that situation.

but lacks a reading corresponding to paraphrase (3) of (1).

Obviously, the source of the difference between (1) and (4) is a difference in lexical semantic properties of the verbs *find out* and *wonder*. What you find out if you find out which students cheat, is the true answer to the question which students cheat, i.e., you stand in the relation of finding out to the proposition that is the true answer to the question which students cheat. In case you wonder which students cheat, you do not stand in a relation to the proposition that expresses the true answer, rather you bear a particular relation to the question as such expressed by the interrogative, a relation which can be roughly paraphrased as that of wanting to find out the true answer to that question. In the terminology used above, we can say that the difference between verbs such as *find out* and verbs such as *wonder* is that whereas the latter are intensional the former are extensional.

Within the confines of the particular approach outlined above, this difference is accounted for by means of the usual distinction between the intension and the extension of an expression. The extension of an (embedded) interrogative is a proposition, its intension a (particular kind of) propositional concept. A verb such as *find out* takes the extension of an (embedded) interrogative as semantic argument, and a verb like *wonder* operates on its intension.

One thing to note here, is that the distinction between extensional and intensional embedding verbs does not coincide with the distinction between factive and non-factive verbs. Verbs like *know* or *find out* are factive with respect to their indicative complements. Knowing or finding out that Mary is asleep entails (presupposes) that Mary is actually asleep. Verbs like *tell* or *believe* on the other hand, are not factive. Telling or believing that Mary is asleep does not entail (presuppose) that she actually is. Note however that, unlike *believe*, *tell* can also take interrogatives as argument, as in *John tells whether Mary is asleep*. And in that case *tell* does behave in a factive manner: if John tells whether Mary is asleep, then it follows that if Mary actually is asleep, he tells that she is asleep, and that if she is not, he tells that she is not.

It is remarkable that this property of *tell* simply falls out the independently motivated assumption that it is an extensional embedding verb. To tell whether Mary is asleep means to tell the true answer to the question whether Mary is asleep, which if Mary is asleep is the proposition that Mary is asleep, and if she is not, is the proposition that she is not.

Let us take stock. It seems that the phenomenon of quantificational variability in interrogatives is a real one. And on the face of it, it seems to be in conflict with exhaustiveness. However, the latter is an independently motivated feature, and giving it up has all kinds of drawbacks. What we want to show in the remainder of this paper is that, appearances (and Berman) not withstanding, quantificational variability can be accounted for in an approach which complies with strong exhaustiveness.

The remainder of the paper is organized as follows. In section 2, we sketch how the semantic analysis of interrogatives outlined above can be implemented. In section 3 we discuss the challenge that Berman's proposals form for this analysis. In section 4 we show how this challenge can be met, making use of some insights from dynamic semantics. The final section 5 contains some concluding remarks.

2. A semantics for interrogatives.

In the previous section we sketched informally the basics of a semantics for interrogatives within a classical intensional framework. This section indicates how such an analysis can be implemented, and investigates the difference between the weak exhaustiveness view and the strong exhaustiveness view.*

Starting point is the assumption that in a world an interrogative denotes the proposition that is expressed by its true answer in that world. For a simple sentential interrogative such as (13a), this means that in case Mary sleeps, it denotes the proposition that Mary sleeps, and in case she does not sleep, it denotes the proposition that she does not. Identifying propositions with sets of possible worlds, this amounts to the following. In a world w, the set of possible worlds denoted by (13a) consists of those worlds w' such that Mary sleeps in w' iff she sleeps in w. Using two-sorted type theory as a representation language, (13c) represents the extension of (13a) in w. By abstracting over w, we get (13d) as a representation of its meaning. Another assumption we have made implies that the *whether*-complement (13b) that corresponds to the interrogative (13a) has the same extension and intension.

---

* See Groenendijk & Stokhof (1982,1984,1989) for more details.

(13) a. Does Mary sleep?
   b. whether Mary sleeps
   c. $\lambda w'[S(w)(m) \leftrightarrow S(w')(m)]$
   d. $\lambda w \lambda w'[S(w)(m) \leftrightarrow S(w')(m)]$

We noted above that interrogative embedding verbs exhibit a distinction that we find quite generally in functional expressions, viz., that between expressions which operate on the extension of their arguments, and those which take their intension. Examples of extensional verbs are *know* and *tell*, and *wonder* is an example of an intensional verb. This gives a straightforward account of the fact that (14a) and (14b) together entail (14c):

(14) a. John knows whether Mary sleeps.
   a′. $K(w)(j, \lambda w'[S(w)(m) \leftrightarrow S(w')(m)])$
   b. Mary sleeps.
   b′. $S(w)(m)$
   c. John knows that Mary sleeps.
   c′. $K(w)(j, \lambda w'[S(w')(m)])$

Notice that this does not hinge on the factivity of the verb *know*. For as is shown in (15) the same entailment goes through for the non-factive verb *tell*:

(15) a. John tells whether Mary sleeps.
   a′. $T(w)(j, \lambda w'[S(w)(m) \leftrightarrow S(w')(m)])$
   b. Mary sleeps.
   b′. $S(w)(m)$
   c. John tells that Mary sleeps.
   c′. $T(w)(j, \lambda w'[S(w')(m)])$

Given that *wonder* is an intensional verb, similar entailments do not occur with (16), wondering being a relation between individuals and questions, and not between individuals and propositions:

(16) a. John wonders whether Mary sleeps.
   a′. $W(w)(j, \lambda w \lambda w'[S(w)(m) \leftrightarrow S(w')(m)])$

The meaning of a constituent interrogative, like the one in (17), is derived in a two-step process. As we pointed out above, a constituent interrogative is associated with a relation. In the case of (17a) it is the property (one-place relation) of being a girl that sleeps, which is expressed by (17b). What the constituent interrogative asks for is a specification of the extension of the corresponding relation. The expression (17c) gives such a specification for the property in (17b), for in a world w it denotes the proposition that is true in a world w' iff the girls that sleep in w', are the same as the girls that sleep in w. This proposition gives an exhaustive specification of the extension of the property of being a sleeping girl in w. The expression (17d) represents the corresponding intension, i.e., the question expresssed by (17a).

(17) a. Which girl(s) sleep(s)?
b. $\lambda x[G(w)(x) \wedge S(w)(x)]$
c. $\lambda w'\forall x[[G(w)(x) \wedge S(w)(x)] \leftrightarrow [G(w')(x) \wedge S(w')(x)]]$
d. $\lambda w\lambda w'\forall x[[G(w)(x) \wedge S(w)(x)] \leftrightarrow [G(w')(x) \wedge S(w')(x)]]$

This analysis represents the strong exhaustiveness view on the meaning of constituent interrogatives. For an answer to (17a) should express the proposition denoted by (17c), and hence it should not just say that $a_1 \ldots a_n$ are girls that sleep, but also that no other individual is. That is, an answer should specify that $a_1 \ldots a_n$ together form the entire positive extension of the property of being a girl that sleeps, not just that they are (among the) girls that sleep. An answer that contains only the latter information is weakly, but not strongly exhaustive. The weak exhaustiveness view can be represented in a similar fashion as the strong exhaustiveness approach:

(18) a. Which girl(s) sleep(s)?
b. $\lambda x[G(w)(x) \wedge S(w)(x)]$
c. $\lambda w'\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]]$
d. $\lambda w\lambda w'\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]]$

The derivation of multiple constituent interrogatives follows the same pattern as that of single constituent interrogatives. Starting point is an expression R^n which expresses an n-place relation. The denotation of the interrogative based on R^n in a world w is the proposition which is true in those worlds w' for which it holds that the extension of R^n in w' is the same as that in w. Thus we arive at the following general schema:

$$\lambda w'\forall x_1 \ldots x_n[R(w)(x_1 \ldots x_n) \leftrightarrow R(w')(x_1 \ldots x_n)]$$

Again, this is the strong exhaustiveness view. Weakly exhaustive interpretations result if we require not identity of extension, but only inclusion:

$$\lambda w'\forall x_1 \ldots x_n[R(w)(x_1 \ldots x_n) \rightarrow R(w')(x_1 \ldots x_n)]$$

Notice that it is only on the strong exhaustiveness approach that sentential interrogatives fall out of in the general schema: they result if $n = 0$. The weak exhaustiveness analysis would need a separate interpretation rule for sentential interrogatives.

Embedded constituent interrogatives are derived by the same process as embedded sentential interrogatives. Verbs like *wonder* operate on the intension of their argument, verbs like *tell* or *know* on its extension. This means that sentences like (19a) and (20a) translate as (19b) and (20b) on the weak exhaustiveness approach, and that (19c) and (20c) are the representation that the strong exhaustiveness view gives rise to:

(19) a. John wonders which girl(s) sleep(s).
  b. $W(w)(j, \lambda w \lambda w' \forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]])$
  c. $W(w)(j, \lambda w \lambda w' \forall x[[G(w)(x) \wedge S(w)(x)] \leftrightarrow [G(w')(x) \wedge S(w')(x)]])$

(20) a. John tells which girl(s) sleep(s).
  b. $T(w)(j, \lambda w' \forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]])$
  c. $T(w)(j, \lambda w' \forall x[[G(w)(x) \wedge S(w)(x)] \leftrightarrow [G(w')(x) \wedge S(w')(x)]])$

On both approaches *wonder* expresses a relation to the question which girl(s) sleep(s), and *tell* a relation to the true answer to that question. Moreover, notice that neither approach needs an additional factivity postulate for *tell*.

Let us look a little bit closer at what the two notions of exhaustiveness amount to in the case of (20). Under the assumption that *tell* is closed under entailment, the weakly exhaustive interpretation (20b) follows from the strongly exhaustive interpretation (20c). And if we assume that it is closed under conjunction, then the weakly exhaustive reading (20b) is equivalent with (21), and hence, the latter is also entailed by the strong exhaustive reading (20c):

(21) $\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$

In the case of (19), which contains the intensional *wonder*, an analogous paraphrase/entailment is not obtainable. The quantification over girls that sleep in w cannot be raised over the verb, because it is inside the scope of the intensionalizing λw.

The expression in (21) represents the paraphrase that Berman would give for (20a). But Berman arrives at such a result only by means of a factivity postulate for *tell* with embedded interrogatives, whereas no such assumption is necessary on the approach outlined above.

Before we turn to the strongly exhaustive interpretation, let us be a little bit more explicit about the transition from (20b) to (21). The two assumptions we made concerning the meaning of *tell*, viz., that if one tells p and p entails q, one also tells q, and that if one tells p and tells q, then one tells p and q, can be explicated in a Hintikka-style semantics for proposition embedding verbs. Within that framework every such verb V is associated with a predicate of possible worlds $V_{x,w}$. For example, with T for *tell* and

j for John, the extension of $T_{j,w}$ is the set of worlds compatible with what John tells in w. Then it is laid down that John tells p in world w iff all worlds w' for which $T_{j,w}$ holds are worlds in which p is true. This gives us equivalences such as:

$$T(w)(j,p) \Leftrightarrow \forall w'[T_{j,w}(w') \rightarrow p(w')]$$

Given that much, (20b) can be represented as (22), and (21) as (23):

(22) $\forall w'[T_{j,w}(w') \rightarrow \forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]]]$

(23) $\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]$

The equivalence of (22) and (23), and hence of (20b) and (21), is a simple matter of predicate logic.

Turning to the strongly exhaustive reading of (20a), which was given as (20c) above, we notice that it can also be represented as (24):

(24) $\forall w'[T_{j,w}(w') \rightarrow \forall x[[G(w)(x) \wedge S(w)(x)] \leftrightarrow [G(w')(x) \wedge S(w')(x)]]]$

Since (24) can be 'decomposed' into the conjunction of (22), which represents the weakly exhaustive reading, and (25):

(25) $\forall w'[T_{j,w}(w') \rightarrow \forall x[[G(w')(x) \wedge S(w')(x)] \rightarrow [G(w)(x) \wedge S(w)(x)]]]$

the latter gives the additional information which distinguishes the strongly exhaustive interpretation from the weakly exhaustive one. What this additional information amounts to, is perhaps more perspicuously formulated in (26)*, which is equivalent to (25):

(26) $\forall x[\exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)] \rightarrow [G(w)(x) \wedge S(w)(x)]]$

This expresses that if it is compatible with what John tells that someone is a girl who sleeps, then this person actually is a girl who sleeps. For one thing, this means that if John tells of someone that she is a girl who sleeps, which implies that this is compatible with what he tells, then she actually is. (This gives us the factivity of *tell* when embedding an interrogative.) From the formulation (26) it is also obvious that the possibility that of some individuals John is not sure whether they are girls that are asleep is excluded on the strongly exhaustive reading. If it is compatible with what he tells that someone is a girl who sleeps, then, as (26) implies, she actually is. And from the weakly exhaustive part, expressed in (23), we know that if the latter is the case he tells that she sleeps.

---

* Representations which make use of the compatibility predicate induced by proposition embedding verbs are more perspicuous, at least for our present purposes, and we will use them in what follows when appropriate. But note that we can get our more familiar type of representation back, if we want (or need) to. For example, (26) is equivalent with:

(27) $\forall x[\neg\forall w'[T_{j,w}(w') \rightarrow \neg[G(w')(x) \wedge S(w')(x)]] \rightarrow [G(w)(x) \wedge S(w)(x)]]$

which, using the Hintikka-style definition in the other direction, gives us:

(28) $\forall x[\neg T(w)(j, \lambda w' \neg[G(w')(x) \wedge S(w')(x)]) \rightarrow [G(w)(x) \wedge S(w)(x)]]$

Having thus pinpointed the difference between the weakly and the strongly exhaustive reading, we finally note that we can put together the two conjuncts into which we decomposed (24), viz., (22) and (25), as follows:

$$(27)\ \forall x[[[G(w)(x) \wedge S(w)(x)] \vee \exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)]] \rightarrow \\ [G(w)(x) \wedge S(w)(x) \wedge \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]]$$

To see that this is equivalent to the original representation (20c), note that (23) is of the form $\forall x[\phi \rightarrow \psi]$, and (26) is of the form $\forall x[\chi \rightarrow \phi]$, which combine to $\forall x[[\phi \vee \chi] \rightarrow [\phi \wedge \psi]]$, which is the form of (27). And (27) expresses that if an individual is actually a girl who sleeps or such that it is compatible with what John tells that she is a girl who sleeps, then she actually is a girl who sleeps and such that John tells that she is a girl who sleeps.

It is the observation that (27) (also) represents the strongly exhaustive interpretation that forms the basis of our account of quantificational variability, which is presented in section 4. But first we turn to a closer examination of Berman's proposals.

3. Berman's challenge.

In the semantics sketched above, *wh*-terms do not translate as independent quantificational expressions, but rather function as (restricted) λ-abstraction. Yet it seems that, given the (weakly or strongly) exhaustive nature of questions, they in effect inherently amount to universal quantification. Hence the phenomenon of quantificational variability seems to pose a serious problem for this semantics. The following examples, taken from Berman (1991), illustrate what is at stake:

(28) a. The principal usually finds out which students cheat on the final exam.
b. Sue mostly remembers which of her birthday presents arrived special delivery.
c. With few exceptions, Mary knows which students submitted which abstracts to which conferences.
d. Bill seldom acknowledges which colleagues he gets a good idea from.
e. John discovered which books were stolen from the library.

These sentences have a reading in which the adverbs of quantification, *usually, mostly, with few exceptions, seldom*, seem to have the effect of lending variable quantificational force to the *wh*-terms in these sentences. Notice that the main verb in (28a), *find out*, is factive, but that in (28b), *remember*, is not. Sentence (28c) illustrates that quantificational variability can pertain to several *wh*-terms at the same time. And (28d) shows that it may affect both *wh*-terms and indefinite terms. Finally, (28e) is a case with a non-explicit adverb of quantification. Berman provides the following paraphrases:

(29) a. For most students who cheat on the final exam, the principal finds out of them that they cheat on the final exam.
b. For most of her birthday presents that arrived special delivery, Sue remembers that they arrived special delivery.
c. For most triples of a student, an abstract and a conference such that the student submitted the abstract to the conference, Mary knows that the student submitted the abstract to the conference.
d. For few pairs of a colleague and a good idea such that Bill gets the good idea from the colleague does he acknowledge he gets the good idea from the colleague.
e. For all books that were stolen from the library, John discovered that they were stolen from the library.

If *wh*-phrases inherently have universal quantificational force, how can we explain the quantificational variability exemplified by these sentences? Exhaustiveness, even weak exhaustiveness, seems to be at odds with examples like (28a)–(28d). Berman describes the situation in the following way. He notes that although sentence (30) is contradictory, (31) is not:

(30) John knows who is running, but he doesn't know that George is running.

(31) John mostly knows who is running, but he doesn't know that George is running.

Likewise, he observes that although (32*c*) follows from (32a,b), no such entailment holds between (33*c*) and (33a,b):

(32) a. John knows who is running.
b. George is running.
c. John knows that George is running.

(33) a. John mostly knows who is running.
b. George is running.
c. John knows that George is running.

These observations, Berman concludes, show that exhaustiveness is not an inherent property of interrogatives, and that hence an alternative account of the semantics of embedded constituent interrogatives is needed.

We will now sketch what we take to be the core of Berman's analysis. Starting point is that *wh*-phrases should not be treated as inherently quantificational expressions, but rather in the way indefinites are treated in Lewis/Kamp/Heim-style discourse representation theory.* This means that, like indefinites, *wh*-terms are associated with clauses expressing conditions on free variables. Constituent interrogatives correspond to open formulae. So parallel to example (17) in the previous section, the logical form assigned to (34a) is (34b):

(34) a. which girl(s) sleep(s)
b. $G(x) \wedge S(x)$

A crucial feature of Berman's analysis is that the embedding verbs which we have dubbed 'extensional', such as *know* and *tell*, operate on these open sentences directly. As is to be expected, the binding of the free variables is taken care of by implicit or explicit adverbs of quantification. Via a process of presupposition accommodation the open sentence which is the argument of the embedding verb is 'raised' to act as the restriction of the quantifier corresponding to the adverb. What we have called 'intensional' verbs, such as *wonder*, behave differently, however. Such verbs do not take open sentences as such as their argument, but the questions that can be formed from them. In these cases the free variables in the embedded interrogative get bound as a result of this process of question formation.

Before turning to Berman's account of embedded constituent interrogatives, we first take a look at his rule of question formation. Questions result by prefixing a so-called Q-morpheme to an open sentence containing one of more occurrences of *wh*-terms. The semantic interpretation of the Q-morpheme results in a Hamblin-type interpretation of constituent interrogatives.[*] It is given in (35):[**]

---

* See Lewis (1975), Kamp (1981), Heim (1982).

(35) $[\![Q\phi]\!]^{M,g} = \{p \mid \exists x_1 \ldots x_n : p = [\![\phi]\!]^{M,g}\}$

The existential quantifiers in this definition bind the free variables introduced by the *wh*-terms in the open formula ϕ that corresponds to the constituent interrogative. We see that the semantic result of application of the Q-morpheme to the open sentence is a set of propositions that each represent a possible partial answer. So the interrogative (36a) is represented as (36b), which in terms of the representation language used in this paper amounts to (36c):

(36) a. Which girl(s) sleep(s)?
b. $Q[G(x) \wedge S(x)]$
c $\lambda p \exists x[p = \lambda w[G(w)(x) \wedge S(w)(x)]]$

Let us now look at Berman's analysis of embedded constituent interrogatives. We start with the 'intensional' case. As was indicated above, 'intensional' verbs take as their argument the question expressed by the embedded interrogative. Hence a sentence such as (37a) is assigned the logical form (37b):

(37) a. John wonders which girl(s) sleep(s).
b. $W(j, Q[G(x) \wedge S(x)])$

If we compare this analysis with the one given in the previous section we notice that in both the argument of the verb is a question, which in its turn determines answerhood. However, the analyses differ substantially in their view on the nature of answers, and hence questions. The analysis of section 2 associates an interrogative in a world with one complete true answer. In Berman's analysis an interrogative is linked to the same set of all possible partial answers in every world. From this set we can extract the true partial answers in a world, by selecting the propositions which are true in that world. That, in effect, would amount to Karttunen's analysis.[*] If we take the intersection of the resulting set of propositions, we end up with the weakly exhaustive analysis outlined in the previous section. And if we add a clause stating that no other individuals satisfy the relation on which the interrogative is based, the strongly exhaustive analysis results. It is worth noticing that Berman could have chosen any of these alternative interpretations of the Q-morpheme. The only thing that is essential for his approach is that the Q-morpheme takes care of the binding of the variables introduced by the *wh*-terms in the embedded interrogative. Of course, the choice between these alternatives, Hamblin-type, Karttunen-type, weakly exhaustive, strongly exhaustive, is not a matter of taste but has to be made on empirical and methodological grounds, as we have argued extensively elsewhere.

---

[*] See Hamblin (1973).

[**] Notice that the interpretation scheme for the Q-morpheme does not give proper results in case we are dealing with a sentential interrogative. Since in that case the sentence does not contain *wh*-terms, no existential quantifiation would be involved. The result would be $[\![Q\phi]\!]^{M,g} = \{p \mid p = [\![\phi]\!]^{M,g}\}$. This gives us only the proposition expressed by ϕ, i.e., only the 'positive' answer. But that is not the only possible answer. Hence, in case of sentential interrogatives, we should rather interpret the Q-morpheme as follows: $[\![Q\phi]\!]^{M,g} = \{p \mid p = [\![\phi]\!]^{M,g} \vee p = [\![\neg\phi]\!]^{M,g}\}$. In fact, this flaw in Berman's analysis is directly related to the matter of exhaustiveness. For recall that the general scheme for interrogative formation that was stated in the previous section, which starts from an n-place relation, with sentential interrogatives in the case of $n = 0$, and which lets the question be the equivalence relation on possible worlds of having the same (positive) extension, results in strongly exhaustive readings.

Now we come to Berman's account of the 'extensional' cases. As we said above, Berman assumes that these verbs operate on the open formulae associated with the constituent interrogatives, and not on the questions that can be formed from them. A further assumption which he makes, in line with the standard approach to adverbs of quantification,[**] is that the logical form of sentences such as (38a) and (39a) is a tripartite structure. The three constituents of this structure are: an adverb of quantification (if no adverb occurs, universal quantification is the default); the restriction of the quantification; and the nuclear scope of the quantification. Consider the following simple examples, one with and one without an explicit adverb of quantification:

(38) a. John usually knows which girl(s) sleep(s).
b. $\textsc{most}_x[G(x) \wedge S(x)][K(j, \mathrm{girl}(x) \wedge S(x))]$

(39) a. John tells which girl(s) sleep(s).
b. $\textsc{all}_x[G(x) \wedge S(x)][T(j, \mathrm{girl}(x) \wedge S(x))]$

The logical forms (38b) and (39b) illustrate the general pattern. The nuclear scope consists of the embedding verb and its two arguments: the subject and the open formula corresponding to the constituent interrogative. The restriction is formed by the same open formula. It gets there via the process of presupposition accommodation. In case of verbs such as *know*, this process operates with the presupposition standardly associated with factive verbs. In case of non-factive verbs such as *tell*, the assumption has to be made that such verbs are factive when embedding an interrogative, despite the fact that they are not factive in general. The adverb quantifies non-selectively over the free variables in its arguments, and thus takes care of the binding.

---

[*] See Karttunen (1977).

[**] See Lewis (1975).

In Berman's analysis the difference between the 'intensional' and the 'extensional' cases is taken to reside in different structural properties of the sentences in question. It is assumed that a sentence such as (37a), in which the intensional verb *wonder* occurs, does not give rise to a tripartite structure because *wonder* is not factive and because it operates on questions rather than open formulae. In the resulting logical form there are no free variables left for an adverb of quantification to bind, since they are bound already by the Q-morpheme. Hence such sentences do not exhibit quantificational variability.

Let us now turn to an evaluation of Berman's proposal. The main thing to note is that at essential points his analysis of embedded and non-embedded interrogatives is not in accordance with some of the general assumptions outlined in the introductory section. The 'stand alone' and embedded occurrences of interrogatives are not treated uniformly throughout. Remarkable is the radical difference between the kind of semantic object associated with an interrogative embedded by a verb like *wonder* and that expressed by an interrogative that is the argument of verbs such as *know* and *tell*. The latter verbs operate on open formulae, not on questions, as the former do. Also note that these open formulae as such cannot be associated with answers to the corresponding questions. A reasonable semantics for sentences of this type results not simply after combining the verb with its argument, but only after the subsequent procedure of accommodating the embedded interrogative as a presupposition in the restriction of an (implicit or explicit) adverb of quantification. Also, this procedure requires an assumption of factivity for such verbs as *tell* which ascribes them the property of presupposing their argument just in cases this is an interrogative. This makes a lexical semantic property dependent on a structural syntactic one, which is unusual, to say the least. Finally, observe that this difference in type of semantic objects prohibits a uniform account of coordination and entailment.

It seems to us that an analysis that does accord with the general assumptions made in the introductory section, and which is able to explain the differences in possible quantificational variability in terms of a general mechanism, is to be preferred. Therefore, we will outline in the next section how the semantics of interrogatives described above can be made to handle the phenomenon of quantificational variability.

4. Berman's challenge met.

We will show how the analysis of section 2 can be made to meet Berman's challenge stepwise. We start by showing how quantificational variability can be had on the weak exhaustiveness view, since the latter is nearest to Berman's own analysis. Then we will strengthen the result to comply with strong exhaustiveness.

Recall from section 2 that in a weakly exhaustive analysis, a sentence like (40a) is translated as (40b). The latter is equivalent to (40c), which we could also write in 'adverbs of quantification' style as (40d):

(40) a. John tells which girl(s) sleep(s).
b. $T(w)(j, \lambda w' \forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow [G(w')(x) \wedge S(w')(x)]])$
c. $\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$
d. $\text{ALL}_x[G(w)(x) \wedge S(w)(x)][T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$

The last representation is virtually the same as what results in Berman's analysis, but notice that it is obtained without having to assume that *tell* is factive, and without presupposition accomodation, due to the fact that the embedded interrogative is assigned a meaning of its own.

But, as we saw in the previous section, the reason for Berman to deviate from this straightforward analysis are sentences containing explicit adverbs of quantification, such as (41a). As we remarked earlier it seems an inherent feature of both the weakly and the strongly exhaustive analysis that *wh*-terms have universal quantificational force. So the problem is how we can get rid of the universal quantificier ALL_x and 'replace' it by the quantifier MOST_x in order to obtain (41b), which represents the meaning Berman assigns to (41a):

(41) a. John usually tells which girl(s) sleep(s).
b. $\text{MOST}_x[G(w)(x) \wedge S(w)(x)][T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$

This is were dynamic semantics comes in.

In dynamic semantics* indefinites are not analyzed as introducing free variables, as in discourse representation theory, but as quantificational expressions in their own right. A simple donkey sentence like (42a) is translated as (42b). The dynamic interpretation assigned to the existential quantifier makes (42b) equivalent to the ordinary translation (42c) in standard predicate logic:

---

* See Groenendijk & Stokhof (1990,1991).

BEST COPY AVAILABLE

(42) a. If John owns a donkey he beats it
b. $\exists x[D(x) \wedge H(j,x)] \rightarrow B(j,x)$
c. $\forall x[[D(x) \wedge H(j,x)] \rightarrow B(j,x)]$

The interpretation of the existential quantifier in dynamic semantics ensures that the existentially quantified antecedent of (42b) outputs assignments in which the value of the variable x is a donkey that John owns. The interpretation of the implication as a whole is defined in such a way that it takes all such output assignments, and checks whether the values of x satisfy the consequent, i.e., whether they are indeed beaten by John. If so, the implication is considered true. So the truth conditions of (42b) in dynamic semantics are the same as the truth conditions of (42c) in ordinary static semantics. The relevant fact that we make use of here is that in dynamic semantics the following equivalence holds without the usual restriction that x does not occur freely in the consequent:

$$\exists x\phi \rightarrow \psi \Leftrightarrow \forall x[\phi \rightarrow \psi]$$

Observe that, given this fact, in dynamic semantics (40c) is equivalent to (43):

(43) $\exists x[G(w)(x) \wedge S(w)(x)] \rightarrow T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])$

What we need to know next is how adverbs of quantification can be dealt with in a dynamic framework. Following the proposals of Dekker and Chierchia this can be done as follows.* As we noted above, a formula of the form $\exists x\phi$ outputs all those assignments that assign values to x that satisfy ϕ. This makes the variable x available for further quantification. And because of that, the adverb of quantification in $AQ_x[\exists x\phi][\psi]$ can quantify over the output of $\exists x\phi$, and require that a Q-amount of such outputs satisfy the condition ψ. In other words, given the dynamic interpretation of the existential quantifier we obtain equivalences of the following form:

$$AQ_x[\exists x\phi][\psi] \Leftrightarrow Q_x[\phi][\psi]$$

where Q is the ordinary quantifier corresponding to the adverb of quantification AQ, even though the variable x is existentially quantified in the antecedent.

---

* See Dekker (1992), Chierchia (1992). What is said in the text makes use of only a small part of their analyses. For example, we completely disregard the issue of symmetric versus non-symmetric readings, which both Dekker and Chierchia discuss extensively.

For the purposes of the present paper, this much suffices, and we must refer to reader to the papers by Dekker and Chierchia for a substantiation of this claim and more details.

Given these two facts of dynamic semantics, we may rest assured that when an implicational structure of the form (44a) is combined with an adverb of quantification, it can be represented as in (44b), which in the dynamic framework is equivalent with (44c):

(44) a. $\exists x \phi \rightarrow \psi$
b. $AQ[\exists x \phi][\psi]$
c. $Q_x[\phi][\psi]$

Once we know this much, sentences with adverbs of quantification no longer present a problem. Consider again example (41a), repeated below as (45a). We know that we can represent its meaning without the adverb of quantification in the form of the implicational structure (45b), which is equivalent with (45c). The result of combining it with the adverb of quantification can be represented as in (45d), which is equivalent with (45e):

(45) a. John usually tells which girl(s) sleep(s).
b. $\forall x[[G(w)(x) \wedge S(w)(x)] \rightarrow T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$
c. $\exists x[G(w)(x) \wedge S(w)(x)] \rightarrow T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])$
d. $\textsc{usually}[\exists x[G(w)(x) \wedge S(w)(x)]][T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$
e. $\textsc{most}_x[G(w)(x) \wedge S(w)(x)][T(w)(j, \lambda w'[G(w')(x) \wedge S(w')(x)])]$

In this way we can obtain the meanings Berman wants to assign to sentences like (45a), but in a more straightforward and simple way. We make use of extensionality of the verb *tell* without having to assume it to be factive when embedding an interrogative. Interrogatives are assigned an independent and uniform (weakly) exhaustive interpretation. And the quantificational variability induced by the occurrence of adverbs of quantification is obtained by making use of equivalences which rest on independently motivated clauses in dynamic semantics.

This shows how Berman's readings of sentences with adverbs of quantification can be obtained by combining the weakly exhaustive interpretation of interrogatives from section 2 with a dynamic semantic approach to quantification. However, we argued earlier that the weakly exhaustive interpretation is not the right one, and that strong exhaustiveness is needed. Let us repeat what is at stake here. Consider (46a,b,c):

(46) a. John knows which girl(s) sleep(s).
b. Of every girl who sleeps, John knows that she is a girl who sleeps.
c. Of no girl who doesn't sleep, John believes that she is a girl who sleeps.

In section 1 we argued that (46a) entails both (46b) and (46c). However, a weakly exhaustive interpretation only accounts for the entailment between (46a) and (46b), but it does not give us the other one. The latter entailment is what strong exhaustiveness adds to weak exhaustiveness: If it is compatible with what John knows that an individual is a girl who sleeps, then she actually is.*

Similar observations can be made with respect to sentence (47a), which differs from (46a) only in that it contains the adverb of quantification *usually*. Again, the a-sentence should entail both the b- and the c-sentence, but the weakly exhaustive reading accounts only for the first entailment:

(47) a. John usually knows which girl(s) sleep(s).
b. Of most girls who sleep, John knows that they are girls who sleep.
c. Of few girls who don't sleep, John believes that they are girls who sleep.

Establishing the truth conditions of sentences such as (47a) is a complicated matter. In order to decide whether (47a) is true or not, we need access to two sets of individuals: the set of individuals that actually are girls who sleep; and the set of individuals of whom it is compatible with John's information that they are girls who sleep. In order to see what the actual truth conditions are, observe that the latter set may contain not only individuals that actually are girls that sleep, but also individuals of whom John wrongly believes that they are, and individuals of whom he is in doubt as to whether they are girls who sleep or not. Notice further that individuals that actually are girls who sleep may be lacking from it. So from the two sets we start out with we can construct four other sets: the set of individuals John has a definite and correct opnion about; the set containing the individuals about whom he has a wrong opinion; the set consisting of the ones he is in doubt about; and the set containing the ones he misses. The truth conditions of (47a) can be stated in terms of a comparison between the union of the last three sets with the first one: the cardinality of the first should be (considerably) less than that of the second.

Now we turn to quantificational variability and strong exhaustiveness. Repeated below as (48) is the representation of the strongly exhaustive analysis sentence (46a) which we gave at the end of section 2:

(48) $\forall x[[[G(w)(x) \wedge S(w)(x)] \vee \exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)]] \rightarrow$
$[G(w)(x) \wedge S(w)(x) \wedge \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]]$

---

* Another relevant observation is that weak exhaustiveness predicts that *Noone is running* entails *Everyone knows who is running*, and that *John tells that everyone is running* entails *John tells who is running*. In our opinion this is not quite what one would like to have.

Within the framework of dynamic semantics this is equivalent to (49):

(49) $\exists x[[G(w)(x) \wedge S(w)(x)] \vee \exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)]] \rightarrow$
$[G(w)(x) \wedge S(w)(x) \wedge \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]$

And this represents the required strongly exhaustive interpretation. Notice that we obtain this result without recourse to the assumption that sentences like this contain an implicit adverb of quantification.

Also, we know that given the dynamic treatment of adverbs of quantification (47a) can be represented as (50):

(50) $\text{USUALLY}[\exists x[[G(w)(x) \wedge S(w)(x)] \vee \exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)]]]$
$[G(w)(x) \wedge S(w)(x) \wedge \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]$

And (50), we know, is equivalent with (51):

(51) $\text{MOST}_x[[G(w)(x) \wedge S(w)(x)] \vee \exists w'[T_{j,w}(w') \wedge G(w')(x) \wedge S(w')(x)]]$
$[G(w)(x) \wedge S(w)(x) \wedge \forall w'[T_{j,w}(w') \rightarrow [G(w')(x) \wedge S(w')(x)]]]$

This gives the right quantificational results. According to the restriction clause the quantification is over individuals that are either girls that actually sleep or individuals of whom it is compatible with what John tells that they are girls who sleep (or both). The quantifier requires that most of them should be girls who sleep and that John should tell that they are. It is easy to see that this strongly exhaustive interpretation entails Berman's weakly exhaustive reading. For if we simply drop the second disjunct in the restriction clause in (51) the number of individuals quantified over becomes potentially less. If John is correct about most individuals in the larger set, then he is certainly also right about most individuals in potentially smaller set.

The quantifiers ALL and MOST that correspond to the adverbs *always* and *usually* have in common that they are upward monotonic. Let us conclude this section with an investigation of two downward monotonic cases. If we replace MOST in (51) by FEW, we may observe that because of the downward monotonicity of FEW, Berman's weakly exhaustive interpretation now entails the strongly exhaustive one, rather than the other way around, as in the case of ALL and MOST. To see that this is so, suppose that of about 50 percent of the girls that are asleep, John tells that they are, then according to Berman's analysis it is false that John seldomly tells which girl(s) sleep(s), even if at the same time John tells of a large amount of individuals that are not girls that sleep, that they are. This is clearly not correct. The strongly exhaustive analysis correctly predicts that in this case it is true that John rarely tells which girl(s) sleep(s). If we look at the individuals that actually sleep and at those that actually do not but of whom John tells that they do, then he is correct only in few cases.

With NO things are slightly different. In that case the two approaches give equivalent results. This can be seen as follows. The second disjunct in the restriction clause potentially adds cases that have to be taken into consideration. But if it really adds an individual, this should not be a girl that actually sleeps, i.e., this should not be an individual that already satisfies the first disjunct of the restriction clause. But such individuals cannot satisfy the nuclear scope clause, since they will not satisfy the first conjunct of it. These results seem to be in accordance with the facts.

The discussion of these examples shows that quantificational variability and strong exhaustiveness, contrary to appearance and Berman, are not incompatible. Recasting the analysis of section 2 in the framework of a dynamic semantics allows us to retain the original strongly exhaustive interpretation of interrogatives, which is in accordance with the general assumptions laid down in section 1, and to account for the phenomenon of quantificational variability in embedded interrogatives.

5 Final remarks.

First of all, we want to draw attention to what seems to be a rather fundamental difference between the approach presented in the previous section, and Berman's way of dealing with quantificational variability. The two approaches resemble each other in that both associate sentences containing adverbs of quantification with tripartite structures in which an adverb of quantification takes a restriction clause and a nuclear scope clause as arguments. But the approaches differ not only in what they consider to be the contents of the arguments of the adverb, but also in how they arrive at them. In Berman's case the restriction clause is formed by accommodating a factive presupposition. The analysis presented in the previous section derives the contents of both arguments of the adverb by 'decomposing' the meaning of the sentence without the adverb into two parts, that can be viewed as the antecedent and the consequent of an implicational structure. In Berman's case the relevant presupposition is identical to the propositional argument of the main verb, and hence extractable from surface syntactic structure. In our analysis the restriction clause and the nuclear scope clause cannot be determined at this level. For the surface form of these sentences is not that of an implication. However, we have shown that their semantic representations can be cast in this format within a dynamic framework. So, this analysis seems bound to the view that it is only on the basis of the semantic content of an entire sentence that we can determine what constitutes the restriction and the nuclear scope of an adverb of quantification occurring in it, and that its syntactic structure does not suffice. We are not sure what conclusions can be drawn from this, but we note that this aspect of our analysis seems to be in line with Roberts' argument that domain restriction in general is not simply a matter of what she calls a 'structure driven algorithm', but largely depends on different kinds of contextual (semantic and pragmatic) factors.[*]

Another remark we want to make is that in the analysis proposed in the previous section, a crucial feature of Berman's analysis, viz., that *wh*-terms are to be treated in the same way as indefinites, playes no role. Treating them like indefinites in a dynamic framework would mean translating them in terms of dynamic existential quantification. But this we did not do. (We did make use of dynamic existential quantification, but not in the translation of *wh*-terms as such, but only in order to arrive at the required implicational structure.) Still, it might be interesting to point out that we might do so if for whatever reason this seems to be desirable after all. We have seen that if existential quantification is dynamic, we can 'disclose' the property $\lambda x\phi$ from the existentially quantified formula $\exists x\phi$. This means that in the end it makes no difference whether we deal with *wh*-terms as a form of restricted λ-abstraction, or as dynamic existential quantification.

A perhaps more interesting observation is that in some cases indefinites behave like *wh*-terms. It seems that a sentence like (52a) has a reading (maybe it is even its most likely one) in which it is equivalent with (52b):

(52) a. John (usually) knows whether a girl sleeps.
b. John (usually) knows which girl(s) sleep(s).

On a dynamic account of indefinites, this reading easily falls out.

In fact, even universally quantified terms sometimes lend themselves to quantificational variability, viz., in sentences with so-called pair-list readings. Sentence (53a) has a reading on which it is equivalent with (53b).

(53) a. John (usually) knows which professor recommended every/each student.
b. John (usually) knows which professor recommended which student.

Elsewhere[**] we have given an analysis of a sentence like (53a) which makes it equivalent to (53b). That being so, such sentences lend themselves equally easily to quantificational variability.

The following sentence is a variant of Berman's sentence (28c), cited in section 3. It contains a *wh*-term, an indefinite and a universally quantified term, and illustrates that all three of them can be subject to binding by the same adverb of quantification:

---

[*] See Roberts (1991).

[**] See Groenendijk & Stokhof (1984, chapter 6).

(54) With few exceptions, Mary knows which abstract every student submitted to a conference.

The conslusion we draw from these observations is that although it may be appealing at first sight to treat *wh*-terms in the same way as indefinites in order to account for quantificational variability, in fact this hypothesis seems unwarranted. As the example (54) indicates, we can treat them either as restricted λ-abstraction, or in terms of dynamic existential quantification, or in terms of universal quantification. It does not really matter. As long as we assign interrogatives a strongly exhaustive interpretation, quantificational variability can be accounted for in any of these three alternatives.

References

Belnap, N. D. jr (1981), 'Approaches to the Semantics of Questions in Natural Language. Part I', ms., Pittsburgh.

Berman, S. (1990), 'Towards the Semantics of Open Sentences: *Wh*-Phrases and Indefinites', in L. Torenvliet & M. Stokhof, eds., *Proceedings of the Seventh Amsterdam Colloquium*, ILLC/Department of Philosophy, Amsterdam, 53–77.

Berman, S. (1991), *On the Semantics and Logical Form of* Wh-*Clauses*, dissertation, University of Massachusetts.

Chierchia, G. (1992), 'Anaphora and Dynamic Binding', *Linguistics and Philosophy* **15.2**: 111–184.

Dekker, P. (1992), 'An Update Semantics for Dynamic Predicate Logic', in P. Dekker & M. Stokhof, eds., *Proceedings of the Eighth Amterdam Colloquium*, ILLC/Department of Philosophy, Amsterdam, 113–132.

Groenendijk, J. & M. Stokhof (1982), 'Semantic Analysis of *Wh*-Complements', *Linguistics and Philosophy* **5.2**:175–233.

Groenendijk, J. & M. Stokhof (1984), *Studies on the Semantics of Questions and the Pragmatics of Answers*, dissertation, University of Amsterdam.

Groenendijk, J. & M. Stokhof (1989), 'Type-Shifting Rules and the Semantics of Interrogatives', in G. Chierchia, B. H. Partee & R. Turner, eds., *Properties, Types and Meaning. Volume II: Semantic Issues*, Kluwer, Dordrecht, 21–68.

Groenendijk, J. & M. Stokhof (1990), 'Dynamic Montague Grammar', in L. Kálmán & L. Pólos, eds., *Papers from the Second Symposium on Logic and Language*, Akadémiai Kiadó, Budapest, 3–48.

Groenendijk, J. & M. Stokhof (1991), 'Dynamic Predicate Logic', *Linguistics and Philosophy* **14.1**, 39–100.

Hamblin, C. L. (1973), 'Questions in Montague English', *Foundations of Language* **10**, 41–53.

Heim, I. (1982), *The Semantics of Definite and Indefinite Noun Phrases*, dissertation, University of Massachusetts, Amherst.

Kamp, J. A. W. (1981), 'A Theory of Truth and Semantic Representation', in J. Groenendijk, T. Janssen, & M. Stokhof, eds., *Formal Methods in the Study of Language*, Mathematical Centre, Amsterdam, 277–321. Also in J. Groenendijk, T. Janssen, & M. Stokhof, eds., 1984, *Truth, Interpretation and Information*, Frois, Dordrecht, 1–41

Karttunen, L. (1975), 'Syntax and Semantics of Questions', *Linguistics and Philosophy* **1.1**:3–44.

Lewis, David (1975), 'Adverbs of Quantification', in E. L. Keenan, ed., *Formal Semantics of Natural Language*, Cambridge University Press, Cambridge, 3–15.

Roberts, C. (1991), 'Domain Restriction in Dynamic Semantics', ms., Department of Linguistics, Ohio State University

On the Semantics and Pragmatics of *dake* (and *only*)

Yasunari HARADA[1] Naohiko NOGUCHI[2]
Center for the Study of Language and Information
Stanford University

1. Introduction

Among various particles that attach to nominal elements in Japanese, *dake* corresponds to some extent to English word *only*. There are various similarities and differences between the behavior of these two expressions, and the comparison of the two leads to interesting observations.[3]

Throughout this paper, we will discuss interactions of *dake* and other particles in Japanese. This will provide us with concrete examples on the basis of which to discuss how we should deal with the interaction between the lexical semantics of these words and general pragmatic phenomena relevant for interpreting the sentences which involve them.[4]

Regarding the use of *only* in English, it has been observed that while *only* can precede prepositions, it cannot in general follow them. For instance, Rooth (1985:p.93) notes:[5]

> If [only John] and [even John] are NPs, we expect them to have the distribution of NPs. But *even* and *only* are marginal or impossible in PP:
>
> [14] a. ?At the party, John spoke to only Mary.
> b. *The children play in only the common.
> c. *The library is closed on only Sunday.
> d. *They joked about even the flood.

There are several exceptions to this generalization. Immediately after the statement quoted above, Rooth (1985:p.94) makes the following remark.

---

[1] Also at Waseda University.

[2] Also at Matsushita Electric Industrial, Co., Ltd.

[3] Quite informally, Japanese is a head final language, and complements and adjuncts, all of which are potentially optional and are formed by placing (possibly multiple) particles after nouns, precede verbal elements of the sentence, in which verbs or adjectives are followed by various aspectual and/or modal expressions.

[4] Since our main interest is in semantics and pragmatics, we will give very limited exposition of the syntactic behavior of *dake*. Also, needless to say, we cannot be exhaustive in our description of the semantics and pragmatics of *dake* and *only*.

[5] Similar examples can be found in Taglicht (1984: pp.70-71, esp. examples [43]-[52].)

Taglicht (1984) points out that what he calls 'scalar' occurrences of *only* are exceptions to the restriction on *only/even* in PP:

[16] a. At the party, John spoke to only ONE person.
b. The children play in only TWO parks.
c. The library is closed on only SOME holidays.

Also, in a footnote to the preceding paragraph, Rooth (1985:p.135 note 1) points out the following kinds of examples, although he does not discuss how to deal with these in his later discussions.

> There are other exceptions to the PP restriction:
> (i) John opened the safe with only a screwdriver.
> (ii) John talks about only the most TRIVIAL subjects.
> Note that (i) is not equivalent to (iii).
> (iii) John only opened the safe with a screwdriver.

Moreover, for some speakers, dative-case-marking *to* seems to form a regular exception to the generalization. This has sometimes been attributed to the fact that 'dative' *to* functions as a 'case-marker' and hence has no intrinsic semantic contribution.

(1) a. John gave flowers only to Mary.
b. John gave flowers to only Mary.

The following examples show that in Japanese, too, *dake* can both precede and follow *ni*, which marks 'dative' nouns. This, however, turns out to be the rule rather than the exception, in contrast to English.[6]

(2) a. John ga hana o Mary ni dake ageta.
John NOM flower ACC Mary DAT only gave
(John gave flowers only to Mary.)
b. John ga hana o Mary dake ni ageta.
John NOM flower ACC Mary only DAT gave
(John gave flowers to only Mary.)

The relative positioning of *dake* and *ni* does not affect the readings of the two sentences in (2), but such is not always the case. For instance, in sentences such as (3), the relative positioning of *dake* and *de* results in a clear difference in readings.

(3) a. Soko-ni-wa zitensya **de** **dake** ik-eru.
there-LOC-TOP bike INST only go-can
([I] can get there only by bike.)

---

[6] We will provide Japanese examples with a relatively literal English equivalents, sometimes with paraphrases to make the intended meaning clearer. Those following a '=' are more or less straight-forward paraphrases, whereas those following a '⇒' rephrase the intended meaning. The glosses such as NOMinative, DATive, INSTrument, *etc.* given to various particles are for ease of comprehension only.

b. Soko-ni-wa zitensya **dake de** ik-eru.
there-LOC-TOP bike only INST go-can
([I] can get there by bike alone.)

A similar difference in readings seems to hold in English between the pair of sentences in (4).[7]

(4) a. I can get there only with a bike.
b. I can get there with only a bike.

It might be expected that in these cases the semantic scopes of *dake* in relation to the predicates corresponding to *de* are different because of the relative positionings of the two, and such differences should lead to a difference in interpretation. But when we look at other examples, we notice that what is going on is not that simple, and there seems to be something more to be explained.

Another complication regarding the sentence in (3b) is that there is some 'minimality' associated with "the bike" in comparison to alternative means of "getting there," and something like a 'scalar' interpretation is involved here. Although getting the interpretation for the sentence in (3a) compositionally from the semantics of its components seems to be a relatively straight-forward matter, such is not the case with (3b).

In the discussions that follow, we will give a closer look at these and related phenomena, and address the following questions:

i. How general is the difference in interpretation between the *de-dake* sentences and the *dake-de* sentences observed above? Can we observe similar differences with other particles?

ii. Can this difference be explained merely by a difference in the semantic scopes of *dake* in those sentences and the lexical semantics of *dake*?

iii. Do we have an appropriate explanation for the scalar interpretation that we get for the *dake-de* sentence above? Where does this interpretation come from? From semantics? Or from pragmatics?

2. Interaction of *dake* and other particles

Although giving an exhaustive description of the distributional properties of *dake* is not what we are interested in here, let us see some of the typical properties of the interaction between *dake* and other particles.

---

[7] For some speakers, both of the two sentences in (4) can have either of the two readings. The sentence in (i), however, seems to have only the wide scope reading.

(i) I can only get there with a bike.

Even for those who find a relatively clear-cut difference in readings between (4a) and (4b), this seems to be obscured if we make the bike specific, with heavy contrastive stress.

(ii) I can get there only with THIS bike.

(iii) I can get there with only THIS bike.

2.1. Distribution of *dake*

With respect to case-marking particles *ga* and *o*, *dake* can only precede them, as shown in the following examples.[8] When *dake* is attached, the case-marking particles are optional, especially in the spoken language. Although we cannot go into details here, general considerations of the interaction of various types of particles show that this is a result of syntactic or morpho-syntactic properties of case-marking particles on the one hand and those of *dake* on the other.

(5) a. *Tarô **ga** **dake** kita.
Tarô NOM only came
b. Tarô **dake** (**ga**) kita.
Tarô only (NOM) came
(Only Tarô came.)

(6) a. *Sakana **o** **dake** tabeta.
fish ACC only ate
b. Sakana **dake** (**o**) tabeta.
fish only (ACC) ate
([We] ate only fish.)

One major difference between *only* and *dake* is that while *only* must in general precede prepositions, *dake* can either precede or follow other non-case-marking particles, if the two can be put together at all, as the following two examples show.

(7) a. Nihon **e** **dake** hihan ga muker-are-ta.
Japan DIR only criticism NOM was-directed
(Criticisms were directed only toward Japan.)
b. Nihon **dake** **e** hihan ga muker-are-ta.
Japan only DIR criticism NOM was-directed
(Criticisms were directed toward Japan alone.)

(8) a. Kono sake wa kome **kara** **dake** dekiru.
this sake TOP rice SRC only can-be-made
(This sake can be made only from rice.)
b. Kono sake wa kome **dake** **kara** dekiru.
this sake TOP rice only SRC can-be-made
(This sake can be made from rice alone.)

There is no noticeable difference in meaning between the sentences in (7a) and (7b), while (8a) and (8b) have clearly distinct readings.

---

[8] Here, 'case-marking' is used as a classificatory term among various particles in Japanese. Traditionally, particles in Japanese have been classified into three or four sub-categories based on their cooccurrence properties and their semantic characteristics. In the discussions that follow, however, it will suffice to keep in mind the distinction between 'case-marking' and 'non-case-marking' particles.

Along with other uses for designating 'time' and 'place', the Japanese particle *ni* is sometimes used for marking 'dative' case. However, from syntactic and/or morpho-syntactic point of view, treating *ni* as a case-marking particle on a par with *ga* and *o* is not a good idea. For instance, *ga* and *o* cannot co-occur with the topic-marking particle *wa*, while *ni* can. Also, quantifiers can be floated out of *ga-* or *o-*marked NPs, but cannot out of *ni-*marked phrases, although there are some marginal cases. Since *ni* is not 'case-marking' in these respects, it is natural that *dake* can both precede and follow *ni*, as can be seen from the examples in (2) and (9).

(9) a. Tarô **ni dake** denwa-sita.
Tarô DAT only called
([I] made a phone call only to Tarô.)
b. Tarô **dake ni** denwa-sita.
Tarô only DAT called
([I] made a phone call to only Tarô.)

2.2. Differences in interpretation

In cases where *dake* can both precede and follow other particles, we have to see if there is any difference in the available readings between the two constructions. Here, we will take a closer look at what kinds of difference in interpretation arise under what conditions.

2.2.1. *Dake-ni/ni-dake*

At first glance, it seems as if there is no difference in the available readings between *dake-ni* sentences and *ni-dake* sentences. This is especially true when we look at simple present or past sentences that refer to specific events or situations.

(10) a. Tarô **ni dake** okutta.
Tarô DAT only sent
([I] sent [it] only to Tarô.)
b. Tarô **dake ni** okutta.
Tarô only DAT sent
([I] sent [it] to only Tarô.)

(11) a. Tarô wa zyosi-gakusei **ni dake** eigo o osieteiru.
Tarô TOP female-student DAT only English ACC teaching
(Tarô is teaching English only to female students.)
b. Tarô wa zyosi-gakusei **dake ni** eigo o osieteiru.
Tarô TOP female-student only DAT English ACC teaching
(Tarô is teaching English to female students only.)

The difference in interpretation between the two constructions is not clear in these cases. This might seem comparable to the situation with corresponding English sentences with *only* and dative *to*. Although it might seem plausible to attribute the apparent lack of reading differences between *ni-dake* sentences and *dake-ni* sentences to the lack of 'semantic contribution' of *ni*, we do not think this is the right way to go, on two counts. First, as was mentioned briefly above, from a syntactic/morpho-syntactic point of view, *ni* behaves more like those particles with intrinsic semantic contributions and less like the 'case-marking' particles *ga* or *o*. Second, it is not entirely true that the readings of *dake-ni* and *ni-dake* sentences always coincide.

When we consider 'modal' versions of the above examples, such as (12)-(13), we notice that things are a little more complicated. There seems to be a slight difference in available readings between the *ni-dake* sentences and *dake-ni* sentences. The judgement is rather subtle, but there seems to be at least some clear difference in preferred readings.[9]

(12) a. Tarô **ni** **dake** okutta koto ga aru.
Tarô DAT only sent NL NOM exist
([I] have sent [it] only to Tarô. ⇒ I have on some occasion(s) sent it to Tarô, but I have never sent it to anybody else.)

b. Tarô **dake** **ni** okutta koto ga aru.
Tarô only DAT sent NL NOM exist
([I] have sent [it] to Tarô alone.
⇒ On some occasion(s), I sent it only to Tarô and nobody else, although on other occasion(s) I might have sent it to other people, or
⇒ I have on some occasion(s) sent it to Tarô, but I have never sent it to anybody else.)

(13) a. Tarô wa zyosi-gakusei **ni** **dake** eigo o osieta
Tarô TOP female-student DAT only English ACC taught
koto ga aru.
NL NOM exist
(Tarô has taught English only to female students.
⇒ Tarô has experienced teaching English to female students, but he hasn't taught English to male students.)

b. Tarô wa zyosi-gakusei **dake** **ni** eigo o osieta
Tarô TOP female-student only DAT English ACC taught
koto ga aru.
NL NOM exist

---

[9] In the following example, the symbol NL is intended as a short-hand for 'nominalizer.' Literally, *koto* means 'thing', 'matter', 'fact', *etc.*, but here it means something like 'experience' or 'occasion'.

(Tarô has taught English to female students only.
⇒ Tarô has experienced teaching English to classes that consisted of female students only, or
⇒ Tarô has experienced teaching English to female students,but he hasn't taught English to male students.)

These, along with other examples, show that *dake* is intrinsically ambiguous with respect to its scope in relation to the predicate that other elements in the sentence induce when it immediately follows the noun and precedes other particles, although *dake* can take only wide scope when it follows these other particles.[10]

When the sentence refers to a specific event, however, the difference in the two interpretations is obscured. Take the examples in (10), for instance. In the narrow scope reading, what the sentence means is that the recipient of the sending event consists of a singleton set whose unique member is Tarô, while in the wide scope reading, the sentence means that the sending consisted of a single event, whose unique recipient was Tarô. Although at the level of semantic representation, the two readings will have slightly different forms, the actual truth-conditions come out more or less the same. On the other hand, when there is more than one sending event involved, the difference in the scope of *dake* results in a somewhat clearer difference in the interpretations of the whole sentence.

2.2.2. *Dake-de/de-dake*

Since *de* is not a case-marking particle, *de* and *dake* can combine in any order. However, the combination *de-dake* does not make a reasonable Japanese sentence when the sentence refers to a specific single event.[11]

(14) a. ??Zitensya **de** **dake** itta.
bike INST only went
([I] got [there] only by bike. = I got there only with a bike.)
b. Zitensya **dake** **de** itta.
bike only INST went
([I] got [there] by bike alone. = I got there with only a bike.)

The reason for this oddity of the *de-dake* sentence is that since a single event presupposes a single manner, or a single getting-there event presupposes a single means of transportation, attaching *dake* after the *de*-phrase results in pragmatic anomaly.[12]

---

[10] There is a possible exception to this generalization when *dake* interacts with *de*, to which point we come back later.

[11] A similar remark seems to apply to the English equivalents. Note that the same Japanese sentences could be interpreted as referring to 'experience' or 'habitual or recurrence of events.' In these cases, the sentence might make some sense.

On the other hand, if the sentence is 'modal', making reference to multiple actual or possible events, the resulting *de-dake* sentences make perfect sense, with a relatively clear difference in readings as opposed to *dake-de* sentences.[13]

(15) a. Zitensya **de** **dake** itta koto ga aru.
bike INST only went NL NOM exist
([I] have been [there] only by bike.
= I have been there only with a bike.)
b. Zitensya **dake** **de** itta koto ga aru.
bike only INST went NL NOM exist
([I] have been [there] by bike alone.
= I have been there with only a bike.)

A further point of interest might be to see how all this interact with scalar readings. The sentence (16a) does not make sense, because if one can buy something when one has 50 yen, one should be able to buy it when one has 51 yen or more. On the other hand, the sentence in (17a) makes sense, because it sometimes happens that a particular vending machine requires that one has particular kinds of coins in order to purchase some merchandise from it.

(16) a. ?? Gozyû-en **de** **dake** ka-eru.
50-yen INST only buy-can
(??[You] can buy [it] only with 25 cents.)
b. Gozyû-en **dake** **de** ka-eru.
50-yen only INST buy-can
([You] can buy [it] with only 25 cents.)

(17) a. Gozyû-en-dama **de** **dake** ka-eru.
50-yen-coin INST only buy-can
([You] can buy [it] only with a quarter.)
b. Gozyû-en-dama **dake** **de** ka-eru.
50-yen-coin only INST buy-can
([You] can buy [it] with only a quarter.)

2.3. Summary

To sum up, we can summarize the relevant phenomena roughly as follows:

---

[12] We are indebted to Anna Szabolcsi for her comment to our presentation and her presentation at the SALT-92 conference for clarifying our understanding of this particular phenomena.

[13] Szabolcsi (1992) states that "[r]easons, manners, *etc.* are unique per event: those belonging to a multiplicity of events can be collected into a set."

- In Japanese, *dake* can only precede the 'case-marking' particles *ga* and *o*. With other 'non-case-marking' particles such as *ni*, *de*, *e*, *kara*, *dake* and so on, *dake* can both precede and follow them, with some difference in available interpretations.
- With some exceptions, the '*dake* + particle' construction is semantically ambiguous with respect to the scope of *dake*, while in the 'particle + *dake*' construction, it can have only wide scope.
- If a *dake-ni* sentence refers to a specific event, however, the scope ambiguity may not result in a clear difference in interpretation and the sentence may seem more or less synonymous to the corresponding *ni-dake* sentence. If the sentence makes reference to multiple events, the scope difference results in a subtle difference in preferred readings.
- Since a single event presupposes a single manner, the *de-dake* construction does not make much sense when the sentence refers to a specific event. When the sentence makes reference to multiple events, both the *de-dake* and the *dake-de* constructions make sense.

3. Some explanations for the differences in interpretation

3.1. Semantic scopes of *dake*

In the previous section, we saw that the clear-cut differences in available readings between *de-dake* sentences and *dake-de* sentences are exceptions rather than the rule. In this section, we will focus on how this should be explained in terms of the interaction between semantics and pragmatics of Japanese.

3.1.1. Wide scope, narrow scope, and a 'blocked' case

First, consider the difference in available interpretations with respect to the semantic scope of *dake*. Simplifying somewhat, we saw in the previous section that most sentences with the '*dake* + particle' construction are ambiguous with respect to the semantic scope of *dake*, whereas in sentences with the 'particle + *dake*' construction, *dake* takes only wide scope. It seems appropriate to treat this phenomena as a kind of 'quantifying in' effect of the 'noun + *dake*' construction, just as in the case of quantified NPs in English.

In English, it has been observed that 'only + NP' is sometimes ambiguous in its semantic scope (Taglicht (1984)). For example, there are two readings for (18b): what we are required is to only study physics, or we are only required to study physics. But (18a) has only the former reading. This means that whereas in (18b) *only* can take its scope either over the whole sentence or over the subordinate clause, in (18a) it can only take the narrower scope.

(18) a. We are required to only study physics.
(= What we are required is to only study physics.)

b. We are required to study only physics.
(= We are only required to study physics, or
= What we are required is to only study physics.)

The Japanese ambiguous sentences with the '*dake* + particle' construction can be treated in a similar way.

(19) a. Tarô **ni dake** denwa deki-ta
Tarô to only call can-PAST
(I was able to call only Tarô.
= I was able to call Tarô, and I couldn't call any other person.)
b. Tarô **dake ni** denwa deki-ta
Tarô only to call can-PAST
(I was able to call only Tarô.
= I was able to call Tarô without calling anyone else, or
= I was able to call Tarô, and I couldn't call any other person.)

Here, *dake* takes only sentential scope for (19a), but it can take either sentential scope or narrower scope for (19b). Although the suggested correspondences between English and Japanese are not exact, a comparable explanation for 'quantifying in' effect seems also possible for these Japanese sentences.

On the other hand, for sentences with *dake-de*, there are certain cases where this ambiguity disappears. Our examples in (3) represent exactly the case in question. These are the typical sentences where we can see a clear difference in their interpretations, *i.e.*, (3a) has only the wide scope reading of *dake*, and (3b) seems to have only the narrow scope reading. Namely, in contrast to the previous examples where the 'noun + *dake*' construction has ambiguous scopes, in sentences such as (3b), a wide scope reading of *dake* is somehow 'blocked.'

3.1.2. Interaction between *de*-phrases and 'possible' predicates

When we look at the 'blocked' cases more closely, we notice that we always have *de*-phrases along with some predicate that expresses 'possibility' or 'capability.' Thus it is reasonable to suspect that these 'blocked' cases arise through interactions of 'possible' predicates, *de*-phrases and the semantic scopes of *dake*.

First, let us concentrate on the interaction between *de*-phrases and 'possible' predicates. Consider the sentence in (20) and its interpretations.

(20) Soko-ni-wa zitensya **de** **ik-eru**.
there-LOC-TOP bike INST go-can
([I] can get there by bike.)

There are at least two conceivable interpretations, which can be stated in prose roughly as in (21).

(21) a. It is possible that I get there by bike.
b. If I use a bike, I can get there.

This shows that for this kind of sentence, where *de*-phrases and 'possible' predicates interact, we also have in general a conditional interpretation such as (21b).

There has been a conventional view that conditionals in natural language are essentially related to some modal elements in their semantics (*cf.* Lewis (1973)). We can turn things around, and assume that sentences with modal elements in them will have conditional interpretations in appropriate contexts. Following Kratzer's work (Kratzer (1979, 1981)) on modalized conditionals, Stump (1985) showed that English free adjuncts can have a conditional interpretation in conjunction with modal elements in the main clauses. A typical example is shown in (22).

(22) a. Standing on a chair, John can touch the ceiling.
b. If he stands on a chair, John can touch the ceiling.

The sentence in (22a) can be interpreted as (22b), and the semantic content of (22b) is represented as in (23), using Kratzer's formalism.[14]

(23) **can′**(D(cb)(ˆ**John_stands_on_a_chair′**)) (ˆ**John_touch_the_ceiling′**)

For a Japanese example such as (20), we can think that a conditional interpretation is obtained in a similar way, assuming that *de*-phrases here can act like free adjuncts in English. If we employ Stump's ideas, we can obtain this interpretation from the semantics of modals without extra assumptions. As circumstantial evidence that we are on the right track, we can point out that in the corresponding examples in English (repeated here in (24)), we have a *with*-phrase corresponding to the *de*-phrase in Japanese, and *with*-phrases in general can act as a free adjuncts, as can be seen in the fact that (24) can be paraphrased as (25).

(24) I can get there with a bike.

(25) Using a bike, I can get there.

Thus for (20), where a *de*-phrase and a 'possible' predicate interact, we can represent its conditional interpretation as in (26), using Stump's formalization.

(26) **can′**(D(cb)(ˆ**I_use_a_bike′**)) (ˆ**I_get_there′**)

---

[14] What is important here is simply the fact that we have a conditional interpretation for free adjuncts in modal sentences, and so we won't go into the details of this formalization, though some complementary explanations for this are given below. For more details, see Kratzer (1979,1981), Stump (1985).

a. cb (conversational background): a function from world to a set of propositions
b. D: a function from (g:world → set of propositions, p:proposition, w:world) to a set of all consistent subsets of the union of $g(w)$ and p which contain p.
c. **can′**$(A)(B)$ is true iff $\exists s \in A$ s.t. B is compatible with all supersets of s in A.

3.1.3. The effect of the conditional interpretation

The 'blocked' cases of semantic scopes of *dake* can be explained in terms of conditional interpretations available for these sentences. For each of the sentences in (3), we get a conditional interpretation, as shown in (27) respectively, along the lines discussed in the previous section:

(27) a. Soko-ni-wa zitensya o tukatte dake ik-eru.
there-LOC-TOP bike ACC using only go-can
(= Only with a bike, can I get there.)
b. Soko-ni-wa zitensya dake o tukatte ik-eru.
there-LOC-TOP bike only ACC using go-can
(= With only a bike, I can get there.)

The difference between these two sentences should be clear enough, because in (27a), *dake* (or *only*) takes a scope over the whole conditional (wide scope), but in (27b), the scope of *dake* is within the antecedent clause. If we use the simplest form of intensional logic translation of *only* for *dake* such as (28),[15] we can represent these interpretations as in (29).

(28) $\mathbf{only'} = \lambda P(\lambda Q(Q\{P\} \wedge \forall R(Q\{R\} \rightarrow R = P)))$

(29) a. $\mathbf{only'}({}^\wedge\mathbf{I\_use\_a\_bike'})\ ({}^\wedge\lambda P(\mathbf{can'}(\mathrm{D}(\mathrm{cb})(P))({}^\wedge\mathbf{I\_get\_there'}))) =$
$\mathbf{can'}(\mathrm{D}(\mathrm{cb})({}^\wedge\mathbf{I\_use\_a\_bike'}))\ ({}^\wedge\mathbf{I\_get\_there'}) \wedge$
$\forall Q[\mathbf{can'}(\mathrm{D}(\mathrm{cb})(Q))\ ({}^\wedge\mathbf{I\_get\_there'}) \rightarrow \mathrm{Q} = {}^\wedge\mathbf{I\_use\_a\_bike'}]$
b. $\mathbf{can'}(\mathrm{D}(\mathrm{cb})({}^\wedge\mathbf{only'}({}^\wedge\mathbf{a\_bike'})\ ({}^\wedge\lambda x(\mathbf{I\_use\_}x'))))({}^\wedge\mathbf{I\_get\_there'}) =$
$\mathbf{can'}(\mathrm{D}(\mathrm{cb})({}^\wedge(\mathbf{I\_use\_a\_bike'} \wedge \forall x(\mathbf{I\_use\_}x' \rightarrow x = {}^\wedge\mathbf{a\_bike'}))))$
$({}^\wedge\mathbf{I\_get\_there'})$

For ease of understanding, let us abbreviate Kratzer's modalized conditional by $\rightarrow_{can}$, which includes all the effects of **can**′, D, cb. Then the above logical form would be as follows:

(30) a. $({}^\wedge\mathbf{I\_use\_a\_bike'} \rightarrow_{can} {}^\wedge\mathbf{I\_get\_there'}) \wedge$
$\forall R((R \rightarrow_{can} {}^\wedge\mathbf{I\_get\_there'}) \rightarrow R = {}^\wedge\mathbf{I\_use\_a\_bike'})$
b. $({}^\wedge(\mathbf{I\_use\_a\_bike'} \wedge \forall x(\mathbf{I\_use\_}x' \rightarrow x = {}^\wedge\mathbf{a\_bike'})) \rightarrow_{can} {}^\wedge\mathbf{I\_get\_there'})$

Intuitively, (30a) represents that the only condition which can bring about my getting there is that I use a bike, whereas (30b) represents that the condition that I use a bike and I don't use anything else can bring about my getting there. These logical forms correctly reflect the difference in interpretation.

Given these analyses of the *de*-phrases in question, the 'blocked' interpretation of *dake-de* sentences such as (3b) can be explained in the following way. First, we have a conditional interpretation for (3b) because there is a *de*-phrase and a 'possible' predicate, and the semantics of the 'possible' predicate forces the *de*-phrase to have a conditional interpretation. Second, we interpret *dake* in this conditional interpretation and get something like (29b). Once we get this conditional interpretation, the semantic scope of *dake* would be restricted within the antecedent of the conditional, because the antecedent in a conditional is a scope-island. Thus the wide scope reading of *dake* is 'blocked' by this interpretation.

---

[15] For detailed discussion of semantics of *only*, see Karttunen and Peters (1979), Rooth (1985), and von Stechow (1989).

3.2. The source of the scalar interpretation

As mentioned earlier, sentences with *dake-de* such as (3b), again shown in (31b) below, have a kind of scalar interpretation. The difference in the semantic scopes of *dake* accounts for only part of the difference between the two sentences in (31b). In this section, we will clarify what we mean by the 'scalar' interpretation and investigate where this comes from.

(31) a. Soko-ni-wa zitensya **de** **dake** ik-eru.
there-LOC-TOP bike INST only go-can
([I] can get there only by bike.)
b. Soko-ni-wa zitensya **dake** **de** ik-eru.
there-LOC-TOP bike only INST go-can
([I] can get there by bike alone.)

3.2.1. The nature of the scalar interpretation of the *dake-de* sentences

Morita (1971) was the first to discuss reading differences between the two sentences in (31) and paraphrased the interpretations roughly as follows.[16]

(32) a. Bike is the only means by which I can get there, and I can't get there by any other means of transportation.
b. I can get there by bike alone, and the minimally necessary means which enables me to get there is the bike.

He concluded that the expression *dake-de* itself has such a 'minimal requirement' meaning.[17]

Regarding 'necessity' we feel in connection with this sentence, we understand that "anything other than the bike is not necessary for getting there." With this interpretation of a *dake-de* sentence and the common function of *dake* which excludes anything other than the thing mentioned, it might be expected that (31b) implies that "the bike is necessary for getting there," but this inference turns out to be incorrect, when we think of the intuitive interpretation of the sentence carefully.

---

[16] Kuno (1983) proposed a slightly different analysis of this and related phenomena. In a paper to be read at COLING-92, we discuss these previous analyses of the related phenomena regarding the use of *dake* in Japanese (Noguchi and Harada (1992)).

[17] His discussion on this subject is published in Japanese, and the terminology he employed based on conventional wordings is somewhat unilluminating.

What we get as the intuitive interpretation of the sentence in (31b) is rather that "the bike is one of the sufficient means to get there, and is the minimal in some sense among all the sufficient means."[18] We can think of any scale that we might need, but the most likely one is that of ease of getting there. For example, if we are trying to get to a place far from here, then normally the car is easier than the bike, and the plane is easier than the car. Or, if we have to take a narrow road to get there, then the bike might be easier than the car, or walking might be easier than the bike. One can think of any such scales depending on the context.

In sum, what Morita calls the 'minimal requirement' meaning of *dake-de* sentence such as (31b) comprises the two parts of interpretation shown below.

(33) a. Anything other than the thing mentioned (the bike) is not necessary.
b. The thing mentioned (the bike) is minimal in some sense among all the sufficient means.

Where can we get these parts of the interpretation from? Do they come from the semantics of *dake* or do they come from the interaction of *dake* and other factors? As for (33a), things are relatively easy because we saw that for sentences such as (31), we get a conditional interpretation and *dake* takes only narrow scope for (31b). We show those conditional interpretations again below.

(34) a. Soko-ni-wa zitensya o tukatte dake ik-eru.
(= Only with a bike, can I get there.)
b. Soko-ni-wa zitensya dake o tukatte ik-eru.
(= With only a bike, I can get there.)

Usually, the antecedent of a conditional is a sufficient condition of its consequence. So (34b), which is an interpretation of (31b), can be stated as "using a bike and not using anything else is sufficient for getting there." Then it is not so difficult to see that it means "using anything other than a bike is not necessary for getting there," which is exactly the same as (33a). Therefore, we can conclude that the part of interpretation, (33a), is basically contained in the conditional interpretation of (31b).

Then the rest of the 'minimal requirement' meaning, (33b), would be the true scalar interpretation we should examine here. And the question would boil down to: where does this scalar interpretation come from?

---

[18] What Morita meant exactly by the term 'minimal requirement' is not clear. However, given this interpretation, we cannot take his terminology literally, because the sentence does not mean anything like "the bike is the minimal in some sense among all the necessary means for me to get there."

3.2.2. Is *dake* a scalar particle?

In related discussions about *only* in connection with scalar interpretations, it has been assumed that the so-called focus adverbs are distinguished between (say, ordinary) 'focus particles' and 'scalar particles.' For instance, *also* is an ordinary 'focus particle,' but *even* is a 'scalar particle,' and somehow contains scalar meaning as a part of its lexical semantics. But in the case of *only*, both aspects may be manifest depending on context. Hoeksema and Zwarts (1991:pp.52-53) discuss the following example:

> [4] We are only linguists.
>
> Under the scalar interpretation, one thinks of an ordered set of alternatives for the interpretation of *linguists*, say a set of predicates indicating professional status, such that the property of being a linguist is towards the bottom end of the list and the claim is made that no higher predicate applies to the speaker. Under the non-scalar interpretation, no such ranking is understood, and it is asserted that none of the alternatives applies to the speaker.

Taglicht (1984:p.155) also made a similar distinction. The sentence in (35a), his [112], is ambiguous. He made the distinction between the 'exceptive *only*' and the 'limiting *only*', which corresponds to 'non-scalar' and 'scalar' uses of *only*, respectively. In (35b), his [111], we only have what he calls 'limiting *only*,' and this shows clearly the need to make this kind of distinction.

(35) a. Only yesterday did we have a phone-call from her.
(= At last, we had a phone-call from her yesterday, or
= We had a phone-call from her yesterday and not on other days.)
b. Only yesterday, we had a phone-call from her.
(= As recently as yesterday, we had a phone-call from her.)

These two studies have much in common and they both assume that *only* has two distinct semantic contents; one can roughly be paraphrased as 'no other than (exceptive *only*)' and the other can be paraphrased as 'no more than (limiting *only*)', and they come into play in the interpretation of the whole sentence depending on their contexts.

Jacobs (1983) proposed, on the other hand, that the basic semantic content of *only* is that of 'limiting *only*' and the reading of 'exceptive *only*' arises when all of the alternatives have the same ranking in the scale under consideration.

Another approach is conceivable; we can think that the 'limiting' case is derived from the 'exceptive' case via conversational implicature. Thus, there are three approaches to be considered to account for the two uses of *only* in terms of the semantics/pragmatics distinction.

(36) Possible approaches to the semantics/pragmatics of *only*:

a. the polysemy approach (Taglicht (1984))
There are 2 distinct *onlys* - 'exceptive' and 'limiting.'

b. the non-polysemy approach (Jacobs (1983))
There is only one *only* ('limiting *only*') and 'exceptive *only*' is its special case.

c. the non-polysemy + pragmatics approach
There is only one *only* ('exceptive *only*') and a scalar interpretation is derived as (conversational) implicature.

In Japanese, too, there seem to be some cases where 'limiting *dake*' is involved, such as the following.

(37) San-nin dake kita.
three-people only came
(Only three [people] came. = No more than three people came.)

(38) San-nin dake de motiageta.
three-people only AGNT lifted
(*lit.* By three [people] alone, it was lifted.
= It was lifted by no more than three people.)

But in these cases where 'numeral + *dake*' is involved, it is not easy to determine whether *dake* itself has the limiting function. Sentences with numerals that do not involve *dake* have 'at most' readings pragmatically, as shown below, and those readings are almost equivalent to 'no more than' readings.[19]

(39) San-nin kita.
three-people came
(Three [people] came. ⇒ At least three, and at most three people came.)

(40) San-nin de motiageta.
three-people AGNT lifted
(*lit.* By three [people], it was lifted.
⇒ It was lifted by at least three, and at most three people.)

Thus in cases which involve *dake* as well as numerals such as (37) and (38), it is not clear whether the 'no more than' readings come from the pragmatics of numerals or the semantic/pragmatic nature of *dake*.

Moreover, we do not find uses of *dake* that correspond to the 'limiting *only*' in English as seen in the examples earlier in this section. Literal translations of these English sentences might look something like this:

(41) Koko-ni iru-no-wa gengo-gakusya dake-da.

---

[19] As for a numerals themselves, it has been the conventional view that they intrinsically have 'at least' readings, and 'at most' readings are derived pragmatically, say, as a generalized quantity implicature. (See Levinson (1983) and Horn (1989).)

here-LOC be-NL-TOP linguists only-COPULA
(The ones here are only linguists. = There are only linguists here.)

(42) Kinoo (ni) dake kanozyo kara denwa ga atta.
yesterday TIME only her SRC phone-call NOM exist
(Only yesterday, did we have a phone call from her.
= We had a phone call from her only yesterday, and not on other days.)

But for these sentences, we only have the 'exceptive *dake*' reading. To get the same scalar interpretation, we have to use other expressions such as *tadano*, *tan'naru*, *tui*, or *honno*, as shown below.

(43) Wareware wa tadano (tan'naru) gengo-gakusya da.
we TOP simply (merely) linguists COPULA
(= We are simply (merely) linguists.)

(44) Honno (tui) kinoo kanozyo kara denwa ga atta.
just yesterday her SRC phone-call NOM exist
(= Just yesterday, we had a phone-call from her.)

Given these examples, it is difficult to maintain that there are two distinct *dakes*, say an 'exceptive *dake*' and a 'limiting *dake*', even if such might be the case for English *only*.[20]

3.2.3. The status of the scalar interpretation

Let us go back to an examination of the scalar interpretation of *dake-de* sentences. Having examined what this scalar interpretation is in 3.2.1, what we should do now is to see how the part of the interpretation (33b) could be obtained for the sentence (31b).

If there is a 'limiting *dake*' as there is a 'limiting *only*' for English,[21] and if this 'limiting *dake*' is involved in this case, then we should expect something like a 'no more than' interpretation. But the scalar interpretation of (31b), especially its part (33b), does not contain a 'no more than' interpretation. As we saw in the beginning of this section, the scalar interpretation of (31b) involves some ordering among various means of transportation, but this does not involve exclusion of 'higher' parts in this ordering.

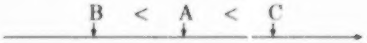
Rather, what we infer is that something higher than 'the bike', say 'the car', is also a sufficient means, but this couldn't be a necessary means. These inference patterns can be captured as shown below.

---

[20] Of course we are not claiming that there is only one semantic content for *dake*. To claim that, we have to examine more examples, especially those with the 'numeral + *dake*' construction, but that is beyond the scope of this paper.

[21] We cannot give a definitive answer as to the existence or non-existence of 'limiting *only*', as can be seen from the discussion in 3.2.2.

(45)



(46) A is necessary $\rightarrow \forall x \leq A$($x$ is necessary) $\rightarrow$ B is necessary
A is sufficient $\rightarrow \forall x \geq A$($x$ is sufficient) $\rightarrow$ C is sufficient
A is necessary $\rightarrow \forall x < A$($x$ isn't sufficient) $\rightarrow$ B isn't sufficient
A is sufficient $\rightarrow \forall x > A$($x$ isn't necessary) $\rightarrow$ C isn't necessary

(45) shows certain scale for A, B, and C all of which are some means to get there. Based on this scale, we can infer about their necessity or sufficiency as shown in (46).

To recapitulate, what we inferred from (31b) is something like "I can get there by anything easier than bike", which is derived from the nature of 'sufficiency' as we depicted in (46). We can also assume that this sufficiency is derived from the conditional interpretation of (31b) because sufficiency and necessity are closely related to the meaning of conditionals. For (31b), "using only a bike" is the antecedent of the conditional, therefore it must be a sufficient condition of the consequence of my getting there. In this sense, we can also infer that "anything higher than the bike is not necessary." This implication is somehow related to the minimality we get for this example.

In (33) we identified two sub-parts of the 'minimal requirement' reading of *dake-de* sentences. The 'necessity' part (33a) is directly associated with the conditional interpretation, and implicatures we get in relation to the necessity-sufficiency scale depicted in (45) come from the conditional interpretation.[22]

In summary, our tentative solution to the scalar interpretation of *dake-de* sentences is as follows. First, *dake* functions 'exceptively', *i.e.*, it excludes use of any other means (of transportation). Then, because of the fact that *de*-phrases can act like free adjuncts in 'possible' contexts, we have conditional interpretation, and finally, this conditional interpretation will make available a kind of scalar interpretation depending on some scale and the inferring pattern on conditionals as shown in (46).

4. Conclusion

In this paper, we discussed the distribution and available readings of sentences involving *dake*, making several claims about how they should be understood in relation to the interaction of semantics and pragmatics in Japanese. After providing a general picture of how *dake* and other particles interact in Japanese, we focused on one particular phenomenon, namely, the interaction of *dake* and *de*, in order to give a concrete example of how we should deal with the interaction between the lexical semantics of these words and general pragmatic phenomena relevant for interpreting the sentences which involve them.

---

[22] The status of (33b) is still unresolved. Currently, we do not have decisive evidence that shows whether it is obtained from the semantics of *dake* or through pragmatics.

Let us summarize how our discussions answered the questions we raised in section 1.3.

- Answer to question (i):
  The clear-cut differentiation in readings between the *de-dake* sentence (3a) and the *dake-de* sentence (3b) is the exception rather than the norm. In cases where other particles are involved, the '*dake* + particle' sentences are semantically ambiguous with respect to the scope of *dake*, while in the 'particle + *dake*' sentences, *dake* can have only wide scope. Thus, usually, '*dake* + particle' sentences can have readings that 'particle + *dake*' sentences have.

- Answer to question (ii):
  Part of the difference in interpretation between *de-dake* sentences and *dake-de* sentences can be explained semantically through the conditional interpretations available for sentences with *de* phrases and 'possible' predicates. But the scalar interpretation of *dake-de* sentences should be explained in terms of pragmatic inference.

- Answer to question (iii):
  The scalar interpretation of *dake-de* sentences is derived through the inference about their conditional interpretations.

Acknowledgements

We would like to thank Peter Sells, Mark Gawron, and Chris Piñón, among others, for helpful suggestions and comments. Special thanks are due to CSLI for providing an ideal research environment for the two of us with such divergent backgrounds. Yasunari HARADA's extended stay at CSLI was made possible in part by a special grant from Waseda University. Naohiko NOGUCHI's visit to CSLI was made possible through Industrial Affiliate Program arrangements between CSLI and Matsushita Electric Industrial, Co.

References

Grice, P.H. (1975) 'Logic and Conversation', in P. Cole and J.L. Morgan, eds., *Syntax and Semantics, Vol.3: Speech Acts*, Academic Press, 41-58.

Hoeksema, J. and Zwarts, F. (1991) 'Some Remarks on Focus Adverbs', *Journal of Semantics* **8**:51-70

Horn, R. (1989) *A Natural History of Negation*, The University of Chicago Press.

Jacobs, J. (1983) *Fokus und Skalen: Zur Syntax und Semantik der Gradpartikeln im Deutschen*, Neimeyer, Tubingen.

Karttunen, L., and Peters, S. (1979) 'Conventional Implicature', in C-K. Oh and D. Dinneen, eds., *Syntax and Semantics, Vol.11*, Academic Press, New York, 1-56.

Kratzer, A. (1979) 'Conditional Necessity and Possibility', in R. Bauerle et al., eds., *Semantics from Different Point of View*, Springer-Verlag, 117-147.

Kratzer, A. (1981) 'Blurred Conditionals', in W. Klein and W. Levelt, eds., *Crossing the Boundaries in Linguistics*, Reidel, Dordrecht, 201-209.

Kuno, S. (1983) *Sin Nihon Bunpô Kenkyuu*, Taisyûkan-syoten.

Levinson, S.C. (1983) *Pragmatics*, Cambridge University Press.

Lewis, D. (1973) *Counterfactuals*, Harvard University Press.

Morita, Y. (1971) 'Dake, Bakari no Yôhô', in *Bulletin of The Institute of Language Teaching*, Vol.10, Waseda University, 1-27.

Noguchi, N. and Harada, Y. (1992) 'Semantic and Pragmatic Interpretations of Japanese Sentences with *DAKE* (*ONLY*)', to appear in the proceedings of COLING-92.

Rooth, M.E. (1985) *Association with Focus*, PhD. Dissertation, University of Massachusetts, Amherst.

von Stechow, A. (1989) 'Focusing and Backgrounding Operators', in *Fachgruppe Sprachwissenschaft der Universitat Konstanz*, Arbeitspapier Nr.6.

Stump, G. (1985) *The Semantic Variability of Absolute Constructions*, Reidel, Dordrecht.

Szabolcsi, Anna (1992) 'Weak Islands and Scope', paper presented at SALT (Semantics and Linguistic Theory), Ohio State University, May 1-3, 1992.

Taglicht, J. (1984) *Message and Emphasis: On focus and scope in English*, Longman.

CSLI, Stanford University
Stanford, CA 94305-4115, U.S.A.
harada@csli.stanford.edu
noguchi@csli.stanford.edu

Yasunari HARADA
School of Law, Waseda University
1-6-1 Nishi-Waseda, Shinjuku-ku
Tokyo 169-50, Japan
harada@cfi.waseda.ac.jp

Naohiko NOGUCHI
Matsushita Electric Industrial
3-10-1 Higasi-mita, Tama
Kawasaki 214, Japan
noguchi@trl.mei.co.jp

VP Ellipsis and Semantic Identity[1]

Daniel Hardt
University of Pennsylvania

1. Introduction

The grammar of English provides a broad array of elliptical constructions, where what is communicated goes beyond what is explicitly stated. One example of this is verb phrase ellipsis, in which a verb phrase is elided, its position marked only by an auxiliary verb. It is generally agreed that VP ellipsis is governed by an identity condition, to the effect that an identical copy of the antecedent is "reconstructed" at the ellipsis site. A basic question arises as to whether the identity condition is to be stated in syntactic or semantic terms.

There is a well known body of evidence which indicates that VP ellipsis is governed by a semantic identity condition. Consider the following example (Sag and Hankamer (1982)):

(1) A: Do you think they will like me?
B: Of course they will.

Here, the only reading of the elliptical VP is "like you"; this preserves the meaning of the antecedent "like me", but it requires that the target and antecedent VP are not syntactically identical. Similarly, examples such as

(2) Wendy is eager to **sail around the world** and Bruce is eager to **climb Kilimanjaro**, but neither of them can because money is too tight.

have been taken to indicate that inference is sometimes required to resolve VP ellipsis, or at least that VP ellipsis must be defined at the level at which inferential relations are definable (Webber (1978)). In sum, it appears that VP ellipsis interacts in a fundamental way with external, non-linguistic mechanisms such as indexicality and inference, which suggests that it must be dealt with at a semantic level.

The most prominent account of VP ellipsis is the "logical form identity theory", due independently to Sag (1976) and Williams (1977). While this theory has sometimes been described as a semantic theory, Partee and Bach (1981) observe that it violates a basic requirement imposed by Montague: namely, that the "logical form" language must be "dispensable". The LF identity theory requires that the LF representation of the elided VP be equivalent to that of the antecedent VP, up to alphabetic variance. This has the effect of requiring that a variable bound outside the antecedent VP be bound by the same token operator in the target. As Partee and Bach point out, this requirement is dependent on "global properties of the IL (intensional logic) representation". This appears to violate compositionality as well as the dispensability of the IL representation language.

---

[1] I am indebted to Robert Frank, Aravind Joshi, Shalom Lappin, Mats Rooth, Ivan Sag, and Bonnie Webber for valuable discussion and suggestions.

The essential point here is that the meaning of a VP cannot be taken simply to be a property; a VP determines a property only relative to a given context. If there is a variable free within the VP, the VP meaning does not determine the value of that variable. So there is no reason to assume that the variable would receive the same value in the antecedent context and the target context, and indeed, the Montagovian framework does not permit the statement of such a requirement. But this is precisely what is required by the LF identity theory.

The following dilemma presents itself: while there are a variety of facts that appear to require a semantic identity condition, the widely accepted Sag/Williams LF identity theory is incompatible with standard model-theoretic approaches to semantics. In this paper, I will argue that the LF identity condition can be rejected in favor of a semantic condition. Using examples involving pronouns free within the antecedent VP, I show that the LF identity condition is violated. Next, I sketch a dynamic system of semantic interpretation in which the identity condition is formulated. I examine additional cases involving variables within the antecedent VP: indexical pronouns, traces, and reciprocals. The semantic identity is shown to apply in all these cases, while a syntactic identity is enforced in none of them.

Next I look at a "discourse effect" in VP ellipsis, that of "combined antecedents". In the current proposal, the semantic identity condition is mediated by a discourse model, much as pronominal anaphora is taken to be mediated by a discourse model. That is, the antecedent causes an associated semantic object to be stored in a discourse model, to be accessed by a subsequent anaphoric expression. It is well known that combinations of distinct entities in the discourse model can become available as antecedents for plural pronouns. I argue that an analogous phenomenon is evidenced with VP ellipsis; that is, combinations of distinct properties can become available as antecedents for VP ellipsis. Finally, I examine and reject two arguments that have been given in favor of alternative syntactic approaches.

2. The Logical Form Identity Theory

The logical form identity theory was proposed independently by Sag (1976) and Williams (1977). A basic principle in this account is the Derived Verb Phrase rule (Partee (1975)), which allows a VP to be represented at Logical Form (LF) as a lambda expression in which the subject is lambda-abstracted. Given this representation, an identity condition follows from the lambda calculus itself: this is the notion of an *alphabetic variant*. Two lambda expressions are alphabetic variants if they differ at most in the naming of bound variables. Applied to VP ellipsis, this condition requires that the antecedent and target VP's must match exactly in the names of any free variables.

A free variable in the antecedent VP is either bound by an operator outside the VP, or it is "globally free". The LF identity theory requires that a globally free variable must refer to the same object in antecedent and target. A variable bound by an operator O outside the VP in the antecedent must be bound by O in the target as well. This requirement is also imposed in the higher order matching approach of Dalrymple et al. (1991).

In fact, this restriction can be violated in a variety of ways, as shown by the following examples[2]:

(3) Every boy$_i$ in Bill's class wanted Mary to **kiss him$_i$**, but three boys$_j$ in John's class actually asked her to [kiss him$_j$].
(bound - bound)

(4) Every boy$_i$ thinks Professor Davidson will **like his$_i$ work**, but in Bill's$_j$ case, I think she actually will [like his$_j$ work].
(bound - free)

(5) Speaking of Mary$_i$, John **asked her$_i$ out**.
Really – I'm surprised that any girl$_j$ would want him to [ask her$_j$ out].
(free - bound)

(6) If Tom$_i$ was having trouble in school, I would **help him$_i$**.
On the other hand, if Harry$_j$ was having trouble, I doubt that I would [help him$_j$].
(free - free)

These examples show that a variable can be bound by distinct operators in antecedent and target ("bound-bound"), or it can be bound in one and free in the other, or indeed, free in both, with distinct referents. It appears, then, that the binding of a pronoun by a particular token operator is not part of the identity condition governing VP ellipsis. This is a welcome conclusion, as it allows us to reject the LF identity condition in favor of an identity condition defined purely in terms of model-theoretic denotations of VP's. I now turn to the definition of such an identity condition.

3. A Semantic Identity Condition

In this section, I sketch an approach to semantic interpretation in which the identity condition on VP ellipsis is formulated. The approach is a dynamic one, as developed in Discourse Representation Theory (Kamp (1981), Heim (1982)) and related theories. In a dynamic approach, meanings are taken to be relations on discourse contexts. The meaning of a VP in this approach is a three place relation on a property, an input discourse model, and an output discourse model. This means that a VP expresses a certain property only relative to a particular discourse context.

---

[2] In these examples, the elided material is displayed in brackets.

3.1. A System of Semantic Interpretation

The semantic interpretation system I will adopt is based on The Incremental Interpretation System (Pereira and Pollack (1991)), which is a computational implementation of the dynamic approach. One difference between this approach and other dynamic systems is the use of assumption storage and discharge. This is essentially the mechanism of Cooper storage (Cooper (1983)) for quantifier scope, but it is applied here to a much broader range of phenomena.

A semantic object is represented as a pair, consisting of a (possibly empty) assumption set, and a sense. Each assumption encodes a dependency on context, while the sense can be thought of as an ordinary truth-conditional meaning representation. Taken together, the assumption:sense pair represents the file change potential of an expression, just as in other dynamic systems. However, there is a certain flexibility of derivation which distinguishes this system from others. For example, a pronoun represents a constraint on the input discourse model, requiring the existence of an appropriate individual. In this system, this constraint is not necessarily applied to the input discourse model at the point when the pronoun is encountered in the derivation. An assumption is stored at that point, which may be discharged at some later stage in the derivation. Each assumption will be represented as a triple, <x,T,P>, where x is a parameter, T is the assumption type, and P represents constraints on the parameter x. The assumption can be thought of as an instruction for determining the contextual meaning of the associated parameter.

Below, I will give simplified versions of Pereira and Pollack's treatment of quantifiers, indefinites, and pronouns. Then I give a semantic account of VP ellipsis, using similar mechanisms.

3.1.1. Quantifiers

The treatment of quantifiers in the Incremental Interpretation system essentially duplicates that of Cooper (1983). A quantified NP is represented by storing a quantifier assumption, together with a parameter representing the sense. At some later stage in the derivation, the quantifier assumption is discharged, determining the scope of the quantifier, and capturing the parameter. There are two general rules for quantifiers, governing the introduction and discharge of quantifier assumptions. A quantified NP is represented as:

$$\{<x,q,n>\}:\ x$$

where x is a parameter, q is the quantifier, and n is the common noun. For example, "every jet" is represented:

$$[\![\textit{every jet}]\!] = \{<x,\text{every},\text{jet}>\}:\ x$$

The discharge of a quantifier assumption is represented as follows:

$$\{<x,q,s>\}:\ p_t \Rightarrow\ :(q\ s\ x)\ p$$

For example:

$$\{<x,\text{every},\text{jet}>\}:\ \text{fly}(x) \Rightarrow\ :\ (\text{every jet } x)\ \text{fly}(x)$$

That is, the quantifier is discharged at some point in which a object of type t (proposition) has been constructed, thus determining the scope of the quantifier. The restricted quantifier is prefixed to the sense to express this.

3.1.2. Indefinites: Evoking Entities

In DRT and related approaches, an indefinite NP evokes a new entity in the discourse model. In the Incremental Interpretation system, an indefinite is represented as the following assumption-sense pair:

$$[\![\textit{a man}]\!] = \{<x,\ \text{indef},\ \text{MAN}>\}:x$$

The sense is simply the parameter x. The assumption represents an instruction to create a new entity of the appropriate type. This is achieved by the eventual discharge of the assumption, as follows:

$$\{A,\ <x,\ \text{indef},\ P>\}:\ s \Rightarrow A:s[e/x]$$
$$\text{such that } e \notin DM_{in} \text{ AND } P(e) \text{ AND } e \in DM_{out}$$

In this case, an entity e is determined, subject to the constraint that it be a "new" entity (not in the input discourse model), and that P holds of e.

3.1.3. Pronouns: Accessing Entities

The semantic representation of the pronoun "he" is as follows:

$$[\![\textit{he}]\!] = \{<x,\ \text{var},\ \text{MALE}>\}:\ x$$

The assumption includes the parameter name x, the assumption type "var", and the constraints ("MALE") placed on the object. The discharge of a "var" assumption is:

$\{A, <x, var, P>\}: s \Rightarrow A:s[e/x]$
such that $e \in DM_{in}$ AND $P(e)$ AND $DM_{in} = DM_{out}$

Here, the entity e must be an element of DM_{in}, and the constraint P must hold of e. (Another possibility is that x is "captured" by a quantifier. The details of this are not of interest here.)

3.2. Rules for VP Ellipsis

In this section, I give rules for VP ellipsis, on an analogy with the rules given above for pronominal reference.

3.2.1. Verb Phrases: Evoking Properties

Just as indefinite NP's evoke entities, a VP evokes a property. I define a new assumption type to implement this, termed "pred". For example, the VP "help him" is represented:

$[\![help\ him]\!] = \{<P, pred, TRUE>, <x, var, MALE>\}: help(\_, x)$

There are two assumptions: in addition to the "var" assumption associated with the pronoun, there is a "pred" assumption associated with the verb. The pred assumption has a parameter P, it is of type "pred", and the constraints are simply "TRUE", i.e., no constraints are imposed. (Perhaps aspectual features might be relevant here for the "pred" assumption, but this will not be dealt with here.)

The discharge of the "pred" assumption is defined as follows:

$\{A, <P,pred,TRUE>\}: s \Rightarrow A:s$
such that $A:s \in DM_{out}$ AND s must be of type "property"

Upon discharge, the "pred" assumption causes the current semantic representation of the VP to be added to the discourse model. Note that undischarged assumptions may be stored as part of the VP meaning. This allows a "sloppy" reading for pronouns within the antecedent VP.

3.2.2. VP Ellipsis: Accessing Properties

Just as a pronoun accesses an entity stored in the discourse model, an elliptical VP accesses a property. An assumption type "epred" ("elliptical predicate") is introduced for this purpose, as shown in the following example:

$[\![did]\!] = \{<P, epred, TRUE>\}: \mathbf{did}$

The discharge of the "epred" assumption is given as follows:

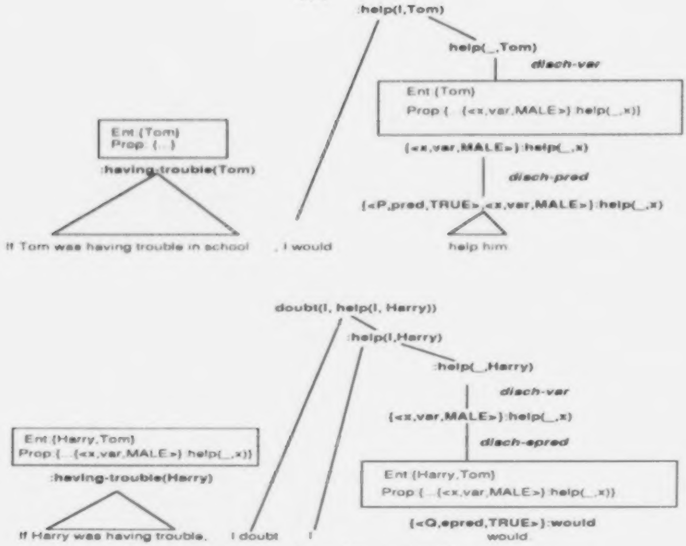

:help(I,Tom)
help(_,Tom)
disch-var
Ent:{Tom}
Prop:{...{<x,var,MALE>}:help(_,x)}
{<x,var,MALE>}:help(_,x)
disch-pred
{<P,pred,TRUE>,<x,var,MALE>}:help(_,x)
help him
Ent:{Tom}
Prop: {...}
:having-trouble(Tom)
If Tom was having trouble in school
, I would
doubt(I, help(I, Harry))
:help(I,Harry)
:help(_,Harry)
disch-var
{<x,var,MALE>}:help(_,x)
disch-epred
Ent:{Harry,Tom}
Prop:{...{<x,var,MALE>}:help(_,x)}
{<Q,epred,TRUE>}:would
would
Ent:{Harry,Tom}
Prop:{...{<x,var,MALE>}:help(_,x)}
:having-trouble(Harry)
If Harry was having trouble,
I doubt
I

Figure 1: Derivation of Example (6)

$$\{<P, \text{epred}, TRUE>\}: \text{did} \Rightarrow A{:}s$$
$$\text{such that } A{:}s \in DM_{in} \text{ AND } DM_{in} = DM_{out}$$

Upon discharge, the "epred" assumption accesses some property (represented by an assumption:sense pair, A:s) stored in the input discourse model.

To illustrate the resultant system, a derivation of example (6) is depicted in Figure 1. Derivation trees of the antecedent and target sentences are given. Each node of a derivation tree contains an assumption:sense pair, together with the current state of the discourse model (displayed in a box). For brevity, the discourse model is sometimes suppressed, as are some derivation steps. The antecedent VP "help him" is represented by the assumption:sense pair

$$\{<P, \text{pred}, TRUE>, <x, \text{var}, MALE>\}: \text{help}(\_, x)$$

The assumptions could be discharged in either order. In the depicted derivation, the "pred" assumption is discharged, causing the VP meaning to be added to the discourse model, with the "var" assumption as yet undischarged. Next, the "var" assumption is discharged, selecting "Tom" in the current discourse model, and the derivation proceeds to construct the representation **help(I,Tom)**. Now consider the elliptical VP "would". Here, the "epred" assumption is discharged, selecting the property associated with "help him" from the discourse model. Next, the "var" assumption is discharged, this time selecting "Harry" from the current discourse model.

It should be clear that the readings in examples (3) to (5) can be similarly derived. In each case, there is a free variable within the antecedent VP. To derive the "sloppy" reading, the assumption for the variable is undischarged when the VP meaning is stored in the discourse model, allowing the variable meaning to be determined independently in the antecedent and target contexts.

Next, I examine cases with other types of variables within the antecedent VP. I begin with the case of indexical pronouns.

4. Indexicals

In example (1), repeated below, I argued that it is the meaning of the antecedent "like me" that is preserved under ellipsis, rather than its syntactic representation[3].

(7) A: Do you think they will like me?
B: Yes, I think they will.

As mentioned above, the only reading is "I think they will [like you]". This is because of the special nature of indexical pronouns, such as "me". Like other uses of pronouns, indexicals determine an individual in context, based on constraints such as number, gender, and the like. What is special about indexicals is that they contribute an individual, rather than a selection-function, to the meaning of an expression.

This is a widely accepted semantic distinction between indexicals and other referential terms, most familiar from the work of Kaplan. Once this distinction is incorporated into our semantic interpretation system, the semantic identity condition gives the desired results for VP ellipsis.

This treatment of indexicals has been illustrated by contrasting an indexical "I" with an equivalent referential term: "the speaker". (Nunberg (1991))

(8) I could have been a contender.

(9) The speaker could have been a contender.

Consider an utterance of these sentences by John Smith. While example (9) could be made true by a (possible) state of affairs in which the speaker was someone other than John Smith and was a contender, this would not make example (8) true.

In the current system, this difference is treated by imposing a special requirement on indexicals, namely, that the associated assumption must be discharged immediately, replacing the parameter with the denoted individual. This requirement, which reflects a general semantic fact about indexicals, gives the desired result in the VP ellipsis case.

---

[3] Based on examples such as these, Sag and Hankamer (1984) sketch a model-theoretic identity condition on VPE that is rather similar in spirit to the current theory. See also Fodor and Sag (1984), and Sag (1981).

The indexical "me" is represented:

[*me*] = {<x,var(index),SPEAKER>}:x

Before combining with the verb "like", the assumption must be discharged, replacing the parameter x with the current speaker, whom I will call "Smith". Thus the only possible antecedent for the elliptical VP will be

{ }:like(_, Smith)

So the only possible meaning for the elliptical VP is "like Smith".

5. Other Variables

I have argued that a pronoun is semantically associated with a free variable, together with an assumption expressing constraints on its eventual referent. I will now examine two cases in which variables are introduce by alternative syntactic forms: first, I look at the case of traces, where a variable is unexpressed syntactically, under familiar syntactic constraints. Then, I look at reciprocals, where a variable is introduced, again together with syntactic constraints. In each case, the syntactic constraints are not enforced under ellipsis.

5.1. Traces

In the following examples, the antecedent VP contains a trace in a relative clause.

(10) He took the job that no one **wanted [e]**, and got the girl that everyone did. (from ad for the film "Career Opportunities")

(11) China is a country that Joe wants to **visit [e]**, and he will too, if he gets an invitation there soon. (Webber 78)

(12) China is a country that Joe doesn't **want to visit [e]**. India is a country that he does, and he will, when he saves enough money for a ticket.

In example (10), the antecedent is "wanted [e]". In the target, the trace is bound by a distinct relative-clause forming operator. On the LF identity theory, the trace in the target would have a different index from that in the antecedent, violating alphabetic variance. In examples (11) and (12), there is a trace in the antecedent, although the target is not within a relative clause, and a syntactic trace would not be permitted. I will assume that there are syntactic constraints governing the distribution of traces, and that these constraints are not imposed in the semantics. Semantically, traces will simply be treated as variables dependent on context in much the same way that pronouns are; that is, they introduce a "var" assumption. The only difference is that, for traces, there are no semantic constraints (eg, number/gender) on the eventual referent.

$$[[e]] = \quad \{< x, \text{var}, \text{TRUE} >\}: x$$
$$[\mathit{visit}\ [e]] = \quad \{< x, \text{var}, \text{TRUE} >\}: \text{visit}(\_, x)$$

This treatment allows examples (10) - (12), in which the trace in the antecedent is either bound differently in the target, or becomes a free variable. Webber (1978) suggests that example (11) involves an inference of the following form:

China is a country that Joe wants to visit ⇒ Joe wants to visit China.

In her account, the inferred sentence provides the appropriate antecedent for the elliptical VP ("visit China").

A new inference schema would be required to account for example (12), since the trace refers to China in the antecedent, but India in the target. The current account provides an explanation for all three examples without any appeal to inference.

These examples suggest that, under ellipsis, traces are relatively unconstrained. This accords with the semantic treatment of a VP with a trace given here. It is difficult to imagine a syntactic identity condition, whether at a Surface Structure or Logical Form level, which would be consonant with these examples.

5.2. Reciprocals

Next, I turn to cases in which the antecedent VP contains a reciprocal. Reciprocals impose two syntactic constraints: they must be locally bound, and they require a plural subject. In the following example, the target occurs in a context where both these requirements are violated.

(13) Irv and Martha wanted to dance with each other, but Martha couldn't, because her husband was there. (Webber 1978)

It is generally held that reciprocal expressions apply a predicate distributively (cf. Bennett (1974), Heim, Lasnik and May (1991)): in this case, the predicate is λ x.dance(x,y). The free variable y is fixed by context. The predicate for the antecedent "dance with each other" is semantically represented:

$$[\mathit{dance\ with\ each\ other}\ ] = \{< y, \text{var}, Q >\}: \text{dance}(\_, y)$$
(where Q requires y to be salient in context)

In example (13), this predicate is applied distributively to Irv and Martha in the source, and applied to Martha in the target, where Irv is a salient referent for the parameter *y*.

Now consider the following variants:

(14) *Irv and Martha wanted to dance with each other. Susan couldn't, because her husband was there.

(15) Irv and Martha wanted to dance. Susan couldn't, because her husband was there.

(16) Mr. and Mrs. Smith were tango champions last year. This year Mr. Smith and Mrs. Jones were going to dance with each other. Mrs. Smith couldn't, because of a sprained ankle.

Example (14) is infelicitous, since the referent corresponding to Susan's partner is not salient. This contrasts with example (15), involving "intransitive" dance. Here, there is no requirement that the "partner" be salient. Finally, example (16) is markedly better than (14), simply because it is pragmatically clear who the partner for Mrs. Smith would be.

The syntactic constraints imposed by reciprocals are clearly not imposed under ellipsis; I have suggested that there is a pragmatic constraint that the free variable must have a salient referent. Since it is less stringent than the syntactic constraint, this constraint only becomes observable under ellipsis.

6. A Discourse Effect: Combined Antecedents

There are cases of VP ellipsis in which the antecedent is combined from two or more separate VP's. This presents a problem for a syntactic account of VP ellipsis, since there is no syntactic object consisting of the combination of two separate VP's. If antecedent properties are stored in the discourse model, as I am suggesting, the possibility of combined antecedents for VP ellipsis is not surprising. For example, it is well known that combinations of entities can become the antecedent for a plural pronoun, giving rise to the following sort of discourse rule:

$$\{x...y...\} \Rightarrow \{x...y...[x,y]\}$$

This rule has the effect of adding a combination of x and y to a discourse model containing the entities x and y, as required by examples such as the following:

(17) **John** arrived in the morning. **Mary** arrived in the afternoon. They left together in the evening.

A similar phenomenon is found with VP ellipsis. Consider the following example:

(18) After the symmetry between left-handed particles and right-handed anti-particles was broken by the kaons in the 1960s, a new symmetry was introduced which everybody swears is unbreakable. This is between left-handed particles **moving forwards in time**, and right-handed anti-particles **moving backwards in time** (none do, in any practical sense, but that does not worry theorists too much). *From:* The Economist, *4 August 1990, p.69. Bonnie Webber, p.c.*

The meaning of the elided VP ("none do") is, I take it, "left-handed particles don't move forwards and right-handed particles don't move backwards in time". The antecedent must therefore consist of a combination of properties associated with two VP's: "moving forwards in time" and "moving backwards in time". Such an example indicates the necessity for a rule allowing the set of properties in the discourse model to be expanded, as follows:

$$\{P...Q...\} \Rightarrow \{P...Q...[P,Q]\}$$

That is, if the discourse model contains two properties P and Q, it may also contain the property resulting from the combination of P and Q.

Another example is the following:

(19) So I say to the conspiracy fans: **leave him alone**. **Leave us alone**. But they won't. *From:* The Welcomat, *5 Feb 92, p.25*

Here the meaning of the elliptical VP is: "they won't leave him alone and they won't leave us alone".

This phenomenon has been noted in the literature, in particular by Webber (1978), in which the following examples were given:

(20) a. I can **walk**, and I can **chew gum**.

b. Gerry can too, but not at the same time.

(21) Wendy is eager to **sail around the world** and Bruce is eager to **climb Kilimanjaro**, but neither of them can because money is too tight.

Webber suggests that inference schemas may account for these examples. However, it appears that the "combining" operation which is generally available for objects in the discourse model is sufficient to account for these examples.

It remains to specify the semantics of a combined property. There are at least two possibilities: the combined property may be applied to an "ordinary" subject, or to a subject that is itself a combination.

[P,Q] x = Px AND Qx.

161

[P,Q] [x,y] = Px AND Qy.

Example (21), in which combined properties are applied to combined entities, is derived as follows. The elliptical VP "can" is represented as the combination of the properties denoted by "sail around the world" and "climb Kilimanjaro", and the pronoun "them" is also a combination, formed from "Wendy" and "Bruce". Ignoring the complication introduced by the quantifier "neither", the application of the combined property to the combined entity is:

[sail around the world, climb Kilimanjaro] [Wendy, Bruce] =
sail around the world(Wendy) AND climb Kilimanjaro(Bruce)

This account predicts that a "distributed" reading of this sort is only possible when the subject and the elliptical VP both represent combined objects. This appears to be the case, as shown by the following example, in which the subject of the elliptical VP is not a combination:

(22) I can **walk**, and I can **chew gum**. Harry and John can too.
(can't mean Harry can walk and John can chew gum)

It is well known that semantic objects in a discourse model must sometimes be combined to serve as the antecedent for subsequent anaphoric expressions. These combining operations are clearly beyond the scope of syntactic theories, since they can operate on objects in distinct sentences. The fact that similar operations are available for VP ellipsis is therefore strong evidence that VP ellipsis cannot be treated syntactically, but rather, in terms of a semantic condition on objects stored in a discourse model.

7. Some Apparent Problem Cases

In this section, I examine two cases that appear to contradict the predictions of this approach. The first case is an example due to Sag (1976), in which it is argued that the LF identity theory rules out a sloppy reading that would be available on my approach. In the second case, it appears that material within the elided VP is subject to syntactic binding theory conditions. It has been argued that this is evidence that VP ellipsis involves syntactic reconstruction rather than a semantic identity condition.

7.1. An Unavailable Sloppy Reading

The following contrast was pointed out by Sag (1976):

(23) John said Mary hit him, and Bill did, too.

(24) John said Mary hit him, and Bill said she did, too.

Sag argues that, while example (23) has both a strict and sloppy reading, example (24) permits only the strict reading. This is predicted by the LF identity theory, since sloppy readings are only possible for variables that corefer with the subject. The same prediction is made by the approach of Dalrymple et al. (1991). On the current approach, both readings are permitted, since sloppy readings arise from a general interaction with the discourse model, and are not restricted to variables that corefer with the subject.

Whatever the explanation for this contrast, it cannot be explained based simply on subject coreference, as in the LF identity theory. This would also rule out the following example:

(25) John said Mary hit him, Bill said she did, and Harry said she did.

Here, the sloppy reading is available – in fact it seems to be preferred. The following example pragmatically requires the sloppy reading, although again the sloppy pronoun does not corefer with the subject of the elided VP.

(26) John_i admitted that Mary had bribed him_i.

(27) Bill_j admitted that she had too. [bribed him_j]

Similarly the LF identity theory would rule out the following discourse:

(28) Did anyone admit that Mary had bribed him?

(29) JOHN admitted that she had.

On the LF theory, no reading would be possible here, since the pronoun "him" must be bound by "anyone" in the target, although it is outside of its scope.

It may be felt that these examples have a slightly artificial quality. This can perhaps be ascribed to the availability of a more concise form, in which the matrix VP is elided. In the following examples, the matrix VP cannot be elided, because contrastive stress is required within the matrix VP:

(30) a. John admitted that Mary had bribed him.

b. Bill didn't ADMIT that she had. He implied it though.

(31) a. John admitted that Mary had bribed him.

b. Bill didn't admit that MARY had. But he admitted that SOMEBODY had.

In these examples, only the sloppy reading is possible, and (at least to my ear) the artificiality is removed.

7.2. Apparent Binding Theory Effects

Another potential problem with a semantic identity condition relates to binding theory effects: it has been argued that binding theory effects are found under ellipsis. Given that binding theory conditions are imposed at a syntactic level, such effects could not be captured by a purely semantic identity condition. Consider the following example (Fiengo and May (1990)):

(32) * Mary introduced John$_i$ to everyone that he$_i$ did.

The infelicity of this example can be explained, according to Fiengo and May, by appealing to the Principle C violation of its non-elliptical counterpart:

(33) * Mary introduced John$_i$ to everyone that he$_i$ introduced John$_i$ to.

However, there are well-known examples in which binding theory conditions do not apply under ellipsis. The following are grammatical examples whose non-elliptical counterparts would be ruled out by binding theory principles:

(34) (Principle A) Betsy couldn't imagine herself dating Bernie, but Sandy could. (Sag 1976)

(35) (Principle B) Even if George won't, Barbara will vote for him.

(36) (Principle C) John got to Sue's apartment before she did. (Dalrymple (1991)).

These examples show that binding theory principles do not apply indifferently to elliptical sentences and their non-elliptical counterparts, as would be expected under a syntactic identity condition. This suggests that the ungrammaticality of example (32) results from pragmatic factors specific to that example.

Consider the non-elliptical grammatical counterpart of (32).

(37) Mary introduced John$_i$ to everyone that he$_i$ introduced HIMSELF to.

The example remains awkward, with stress on "himself" facilitating comprehension. It has frequently been observed that material requiring stress can generally not be elided. In general, surprising or "new" material cannot be elided; the fact that John had already introduced himself to people that Mary introduced him to is certainly new and surprising.

Consider the following examples:

(38) Frank couldn't imagine Betsy$_i$ dating Bernie, but she$_i$ could.

(39) Mary didn't consider Bill$_i$ to be the best candidate for the job, although he$_i$ did.[4]

These examples are, according to my informants, completely acceptable, although their non-elliptical counterparts violate the binding theory in the same way that (32) does. This indicates that, whatever the source of the unacceptability of (32), it is not to be explained by appealing to the binding theory, and thus, it does not constitute evidence for syntactic reconstruction.

8. Conclusions

There has been a persistent intuition that VP ellipsis involves "sameness of meaning" – in other words, it is governed by a semantic identity condition. An essential feature of meanings is that they are relativized to contexts; once this is recognized, it is possible to clearly distinguish between the predictions of a semantic identity condition and that of the LF identity theory. The LF identity theory requires that elements bound by operators outside the antecedent VP must remain bound by the same operator in the target. This ignores the possibility that the target context may differ significantly from the antecedent context, and in just such cases, the constraints of the LF theory are violated.

I have shown that a semantic identity condition, suitably formulated in a dynamic system, accounts for this phenomenon involving variables that are free in the antecedent VP. I have looked at cases involving variables in a wide variety of syntactic incarnations, including pronouns, traces, and the variables introduced in reciprocal constructions. In all of these cases, semantic identity is preserved under ellipsis, even at the expense of changes in syntactic form.

References

Bennett, M. (1974) *Some Extensions of a Montague Fragment of English.* Doctoral Dissertation, UCLA, Los Angeles, California.

Cooper, Robin. (1983) *Quantification and Syntactic Theory.* D. Riedel, Dordrecht, Netherlands.

Dalrymple, Mary. (1991) On Syntactic Reconstruction in Ellipsis. ms.

Dalrymple, Mary, Stuart Shieber and Fernando Pereira. Ellipsis and Higher-Order Unification. (1991) *Linguistics and Philosophy.* Vol. 14, no. 4.

Fodor, Janet Dean and Ivan A. Sag. (1982) Referential and Quantificational Indefinites. *Linguistics and Philosophy* 5, pp. 355-398,

Fiengo, Robert and Robert May. (1990) Ellipsis and Anaphora. Paper presented at GLOW 1990, Cambridge University, Cambridge, England.

Groenendijk, Jeroen and Martin Stokhof. (1991) Dynamic Predicate Logic. *Linguistics and Philosophy.* Vol. 14.

---

[4] This example was suggested to me by Robert Frank.

Heim, Irene. (1981) *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, University of Massachusetts-Amherst.

Heim, Irene, Howard Lasnik, and Robert May. (1991) Reciprocity and Plurality. *Linguistic Inquiry*. Vol 22, no. 1. Winter 1991.

Kamp, Hans. (1980) A Theory of Truth and Semantic Representation. In Groenendijk, J, Jannsen, T.M.V. and Stokhof, M. (eds.) *Formal Methods in the Study of Language*, Volume 136, pp. 277-322.

Kaplan, David (1989) Demonstratives. In *Themes From Kaplan*, edited by Joseph Almog, John Perry, and Howard Wettstein. Oxford University Press.

Montague, Richard. (1974) *Formal Philosophy*. (edited by R. Thomason), New Haven, CT. Yale University Press.

Nunberg, Geoff. (1991) Varieties of Deference. Talk at University of Pennsylvania.

Partee, Barbara. (1975) Montague Grammar and Transformational Grammar, in *Linguistic Inquiry*, 6.2. 203-300.

Partee, Barbara and Emmon Bach. (1981) Quantification, Pronouns, and VP Anaphora, in J.A.G. Groenendijk, T.M.V. Jannsen, and M.B.J. Stokhof (eds.), *Formal Methods in the Study of Language*, (Mathematical Center Tract 135), Mathematical Center, Amsterdam, p. 445-481.

Pereira, Fernando and Martha Pollack. (1991) Incremental Interpretation. *Artificial Intelligence*. Vol. 50. no. 1, pp. 37-82. June 1991.

Sag, Ivan A. (1976) *Deletion and Logical Form*. Ph.D. dissertation, MIT. [Published 1980 by Garland Publishing, New York]

Sag, Ivan A. (1981) Partial Variable Assignment Functions, Verb Phrase Ellipsis, and the Dispensability of Logical Form. ms. Stanford University. 1981.

Sag, Ivan A. and Jorge Hankamer. (1984) Towards a Theory of Anaphoric Processing. in *Linguistics and Philosophy* 7, pp 325-345.

Webber, Bonnie Lynn. (1978) *A Formal Approach to Discourse Anaphora*. Ph.D. thesis, Harvard University.

Williams, Edwin. (1977) *Discourse and Logical Form*. *Linguistic Inquiry*, 8(1):101-139. 1977.

Department of Computer and Information Science
University of Pennsylvania
Philadelphia, PA 19104-6228
hardt@unagi.cis.upenn.edu

The Said and the Unsaid

Laurence R. Horn
Yale University

I am delighted to be back in Columbus for semantics in the spring. Twenty-three years ago, when I was here on a similar occasion, on the very first evening of my life spent in the Midwest, I was stopped, frisked, and interrogated by an officer of the law for suspicion of being outside in downtown Columbus and possession of long hair. When I explained I was in town for the First Annual Spring Semantics Festival, the policeman seemed unimpressed. Columbus has clearly matured since 1969, and so have studies in linguistic semantics. I'm not so sure about me.

I have come to live with the fact that the exciting new (or at least only slightly used) way of looking at scalar predicates I developed in my thesis (Horn 1972) is now ritually trotted out, en route to being dismissed, as the 'classical', 'orthodox', 'traditional', or 'standard' neo-Gricean line, a fact which—combined with the fact that it's also taken as embodying the 'radical pragmatics' tradition—leaves me feeling like one more old radical, inexplicably still manning the crumbling barricades of a forgotten campaign, quaint and probably harmless if not entirely irrelevant, sort of like Allen Ginsberg without the beard, or Abbie Hoffman, only a little less dead. So what better way to celebrate the revival of our semantic rites of spring that to survey the utterance interpretation scene by hauling out the tired old bones of the traditional radical line on what is said and what is unsaid?

The new traditionalism

One advantage accruing to the sponsor of a Brand X theory is partial immunity from having to dwell on the specs of the product. But to situate us in the appropriate domain, I'll begin by recalling that on my analysis (Horn 1972, 1973; cf. Gazdar 1979, Hirschberg 1985, Horn 1989: Chapter 4, Wainer & Maida 1990, and Iwańska 1992 on formalization), what is SAID in the use of a weak scalar value like those in boldface in the sentences of (1) is the lower bound (...at least n...), with the upper bound (...at most n...) IMPLICATED as a cancellable inference generated by the maxim of quantity (more on which below).

(1) Scalar predication	1-SIDED READING →	2-SIDED READING
a. Max has **3** children.	'...at least 3...'	'...exactly 3...'
b. You ate **some** of the cookies.	'...some if not all...'	'...some but not all...'
c. It's **possible** she'll win.	'...at least ◊...'	'...◊ but not certain...'
d. Maggie is patriotic **or** quixotic.	'...and perhaps both'	'...but not both'
e. It's **warm** out.	'...at least warm...'	'...but not hot...'

Thus there is no semantic ambiguity on the lexical or sentential level, contrary to e.g. Aristotle's view (cf. also Burton-Roberts 1984) that *possible* is homonymous between the lower-bounded one-sided reading ('at least possible', 'not impossible') and the lower- and upper-bounded two-sided reading ('at least and at most possible', 'neither impossible nor necessary'), and to analogous claims on *some* by Sir William Hamilton of Edinburgh, on the cardinals by Steven Smith, and so on. These were, in short, no straw men I sought to slay with Grice's Modified Occam's Razor in one hand ('Senses are not to be multiplied beyond necessity') and the pragmatic principle of strength or quantity in the other. This latter weapon, essential to any monoguist treatment of scalar values, has been retooled over the years—in a recent paper (Horn 1990a), I explored its roots, touching on the version in (2), among others.

(2) Quantity maxim (Strength rule, etc.)
Strawson's GENERAL RULE OF LINGUISTIC CONDUCT (1952: 178-9), but with acknowledgments to 'Mr H. P. Grice':
One should not make the (logically) lesser, when one could truthfully (and with greater or equal clarity) make the greater claim.
Grice's 'first shot' (1961: 132):
One should not make a weaker statement rather than a stronger one unless there is a good reason for so doing.
Grice's [FIRST] MAXIM OF QUANTITY (1967/1975: 45):
Make your contribution as informative as is required (for the current purposes of the talk–exchange).
Fogelin's RULE OF STRENGTH (1967: 20):
Make the strongest possible claim that you can legitimately defend!
O'Hair's version of the strength rule (1969: 45)
Unless there are outweighing good reasons to the contrary, one should not make a weaker statement rather than a stronger one if the audience is interested in the extra information that would be conveyed by the latter.
Harnish's MAXIM OF QUANTITY-QUALITY (1976: 362):
Make the strongest relevant claim justifiable by your evidence.

Clearly, an idea whose time had come. For Grice, the methods of radical pragmatics were put to the service of defending a conservative semantics, one with truth-conditional operators analyzed very much in the classical Russellian way, with the gap between what that logic gives us and what we seem to need bridged by the assumption that speaker and hearer are in this business together, a business conducted under the banner of the Cooperative Principle and the attendant maxims. Quantity-based scalar implicature—my inviting you to infer from my use of *some*... that for all I know *not all*...—is driven in particular by your knowing (and my knowing your knowing) that I expressed a weaker proposition when I could have, but chose not to, use a no more formally marked utterance that would have expressed a stronger proposition, one that would have unilaterally entailed the one I did express. The pragmatic, context-dependent nature of this inference is standardly supported by invoking contexts in which it disappears. Some recent cancellation instances appear in (3):

(3) Now you see it, now you don't

a. If you want to compare two languages, it helps to know one of them.
(attributed to L. Bloomfield; cf. Hockett 1978)

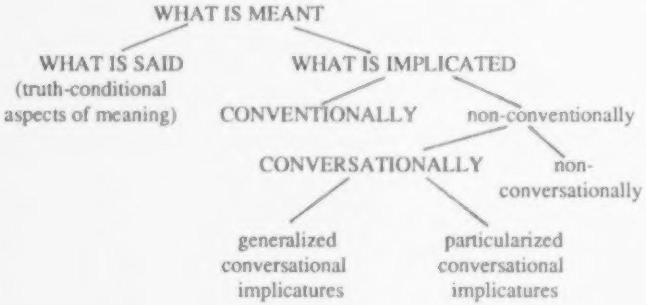
b. —How many months have 28 days?
—All of them.
(Cited in G. G. Pocheptsov, *Language and Humour* , Kiev 1974)

c. 'This changes everything', a startled Mr. Dumas told the Spanish envoy when he showed him the photocopies of the Araquistain documents. 'You of course have the originals?' the lawyer asked casually. 'Not all of them', replied Mr. Fernández Quintanilla, not lying but not telling the truth, either.
(N.Y. Times article, 1991, recounting 'an elaborate bluff' successfully run by diplomat F.Q. to convince Picasso's lawyer that he (F.Q.) possessed the crucial documents to prove Spain was legal owner of Guernica mural; in fact, however, F.Q. had NONE of the originals, only copies)

d. Like the author, I have lost 'few friends' to AIDS. (In fact, I have lost none.) Yet one need not have suffered any personal losses from AIDS to recognize...
(letter to the editor, N.Y. Times 10/19/90, A34)

The cancellability of the upper bound of scalar predications, along with the calculability of the inference by the Quantity or Strength maxim, testifies to its status as a conversational implicatum, rather than either as part of truth-conditional content (what is said) or as a non-truth-conditional component of conventional meaning. Given the Gricean field of play laid out as in (4), the relevant distinctions within the traditional catechism are reproduced in (5):

(4)


WHAT IS MEANT
WHAT IS SAID
(truth-conditional aspects of meaning)
WHAT IS IMPLICATED
CONVENTIONALLY
non-conventionally
CONVERSATIONALLY
non-conversationally
generalized conversational implicatures
particularized conversational implicatures

(5)

	CONVENTIONAL IMPLICATA	CONVERSATIONAL IMPLICATA
a.	Make no contribution to truth conditions, but constrain appropriateness of expressions with which they are associated.	
b.	Unpredictable, arbitrary part of meaning; must be learned ad hoc.	Natural concomitant of what is said or how it is said; NON-CONVENTIONAL by definition.
c.	NON-CANCELABLE; apply in all contexts of utterance.	CANCELABLE, explicitly (by ling. context) or implicitly (by extraling. context)
d.	DETACHABLE: two synonyms may have different conventional implicata	NON-DETACHABLE if arising via content maxims; detachable if arising via Maxim of Manner.
e.	NOT CALCULABLE through any procedure; must be stipulated.	CALCULABLE through Cooperative Principle and the Maxims of Conversation.

But if the upper bound is implicated and not said, how is it that it may come under the scope of logical operators, and in particular of negation? While negating the sentences in (1) usually denies their lower bound, we must also account for the data in (6), where it is the upper bound that comes under attack.

(6)a. This Birthday Card is NOT from one of your admirers!

It's from TWO of your admirers. Happy Birthday From Both of Us!
(outer and inner text respectively of Hallmark card)

b. SOME men aren't chauvinists—ALL men are chauvinists.

c. Chris didn't manage to solve SOME of the problems—he managed to solve ALL of them.

Of course, here the new traditionalist will seek to assimilate those ill-behaved cases to the broader phenomena of METALINGUISTIC NEGATION[1], a device for objecting to a previous utterance of any grounds whatever, including its phonetic or morphological form as in (7), its register or style as in (8), or its focus, point of view, or connotative meaning as in (9):

(7)a. (—So, you [miǽnɨǰd] to solve the problem.)

—No, I didn't [miǽnɨǰ] to solve the problem—I [mǽnɨǰd] to solve the problem.

---

[1] Cf. Horn 1985, Horn 1989: Chapter 6; for critical commentary on 'metalinguistic negation', see now Carston 1985a, Kempson 1986, Burton-Roberts 1989, Horn 1990b, McCawley 1990, Seuren 1990, Sweetser 1990, Foolen 1991, van der Sandt 1991, Wiche 1991, and Iwanska 1992.

b. He didn't call the [POlis], he called the [poLIS]. (*gratia* Andy Rogers)
c. I didn't trap two monGEESE—I trapped two monGOOSes.
d. (—Esker too ah cooPAY luh veeAND?)
—Non, je n'ai pas 'cooPAY luh veeAND': j'ai coupé la viande.

(8) a. Now, Cindy, dear, Grandma would like you to remember that you're a young lady: Phydeaux didn't 'shit the rug', he soiled the carpet.
b. Grandpa isn't feeling lousy, Johnny, he's just a tad indisposed.
c. We didn't make love—we fucked.
d. It's not stewed bunny, honey, it's civet de lapin.

(9) a. Ben Ward is not a black Police Commissioner but a Police Commissioner who is black. (N. Y. Times editorial, 1/8/83)
b. I'm not his daughter—he's my father.
c. I'm not HIS brother—HE's MY brother.
d. She is not Lizzy, if you please—she's Her Imperial Majesty.
e. For a pessimist like you, the glass isn't half full—it's half empty.
f. I'm not a TrotskyITE, I'm a TrotskyIST.
g. They're not the best at what they do—they're the only ones who do what they do. (music critic on The Grateful Dead)
h. Winning isn't everything—it's the only thing.
(attributed to football coach Vince Lombardi)
i. They weren't people, Sir, they were the enemy.
(Lt. William Calley, on My Lai massacre victims)

To these examples, discussed in more detail in my earlier work, we can add the entries in (10):

(10)a. I'm not a Jew...I'm Jew-*ish*. I don't go the whole hog.
(British neurologist/director/comedian Jonathan Miller, in *New Yorker* interview)
b. I am not 'nonwhite'; nor are my friends of Bahamian, Cape Verdian, Colombian, Cuban, Dominican, Jamaican, Japanese, Korean, Panamanian, Puerto Rican or Trinidadian descent. I, a woman of African descent, an African-American if you will, would never be so presumptuous as to characterize 'whites' as 'non-black'...Identity is not 'non' anything.
(Aleah Bacquie, letter to editor of N. Y. Times, 3/14/90)
c. 'You mean he was responsible for the 1984 riots?' the Newstrack interviewer said, referring to Mr. Gandhi.
Mr. Shekhar replied: 'I don't "mean" it. I know it.'
(from N. Y. Times article, 10/22/89, 'Indian News Program Struggles With Censors')
d. 'No, he was *not* a bisexual!' Mr. Georgie affixed an eyelash and approved of it in the lighted mirror. 'H. R. Loomis was *omni* sexual.'
(Fennelly 1985: 83)

Notice in particular that implicata based on Quantity and other maxims may constitute the focus of negation, as in (10c,d) or the examples of (11):

(11)a. A: What brand of motor oil do you use?
B [starting car engine]: Motor oil is motor oil.
[Smoke belches out of B's exhaust.]
Voice-over: Motor oil is definitely NOT motor oil.
(Quantity-based implicatum associated with tautologies; cf. Ward & Hirschberg 1991)

b. Miss X didn't 'produce a series of sounds that corresponded closely with the score of "Home Sweet Home"', dammit, she SANG 'Home Sweet Home', and a lovely rendition it was too!
(Manner-based implicatum, 'Be brief' submaxim; cf. Grice 1975: 55-56)

c. Mozart's sonatas weren't for violin and piano, they were for piano and violin. (Manner-based implicatum, 'Be orderly' submaxim)

The general thesis motivated by these examples—supported by a variety of arguments for why the marked instances of negation illustrated in the sentences of (6)-(11) should receive a unified treatment[2]—can be given as follows (Horn 1989: 377):

> Apparent sentence negation represents either a descriptive truth-functional operator, taking a proposition Φ into a proposition not-Φ (or a predicate *P* into a predicate not-*P*), or a metalinguistic operator which can be glossed 'I object to U', where U is crucially a linguistic utterance rather than an abstract proposition.

This last point, the non-propositional nature of marked negation, is emphasized by an instance of negation brought to my attention by Barbara Abbott:

(12) [Piano student plays passage in manner μ.]
Teacher: It's not [plays passage in manner μ]
—it's [plays same passage in manner μ'].

---

[2] For Karttunen & Peters (1979), a 'contradiction negation' used to reject the conventional implicata (or lexical presuppositions) induced by a given lexical item like the italicized verbs in the sentences of (i) and (ii)

(i) I didn't *manage* to pass the test: I was given the answers.
(ii) I didn't *happen* to be at this intersection as you were passing by: I was expecting you.

is accounted for by assigning this 'plug' negation wide scope with respect to a conjunction of the entailment and conventional implicatum associated with the unnegated sentences. But, as noted in Horn 1985, such an approach does not generalize to the morphosyntactically and intonationally similar negations of the type in (6)-(12) here, where conversational implicata and morphological, phonetic, stylistic, and musical representations would have to be propositionalized to bring them within the scope of a logical negation operator.

The distinction between unmarked and marked functions of negation in scalar contexts was explicitly recognized by Jespersen:

> With quantitative terms not nearly always means 'less than'...but exceptionally these combinations [not once, not much, not three, not half full,...] may convey another meaning; this is the case if we stress the word following not and give it the peculiar intonation indicative of contradiction, and especially, if the negation is followed by a more exact indication: not LUKEWARM, but really hot; not ONCE but two or three times, etc. (Jespersen 1933: 300-1)

Thus, given our examples in (1), we obtain the descriptive (= 'less than') negations of (13) and the metalinguistic negations of (14):

(13)a. Max doesn't have **3** children. (= he has fewer than 3)
b. You didn't eat **any** of the cookies. (note the *some*/*any* suppletion)
c. It isn't **possible** she'll win. (= it's impossible that she'll win)
d. Maggie is patriotic **or** quixotic. (= she's neither patriotic nor quixotic)
e. It isn't **warm** out. (= it's less than warm)

(14)a. He doesn't have **3** children, he has **4**.
b. You didn't eat **some** of the cookies, you ate **all** of them.
c. It isn't **possible** she'll win, it's downright **certain** she will.
d. Maggie isn't patriotic **or** quixotic, she's both patriotic **and** quixotic.
e. It's not **warm** out, it's downright **hot**.

Note the application of Jespersen's features—the focal stress, the intonation indicative of contradiction, and the rectification—diagnostics that I have argued characterize metalinguistic negation, along with restrictions on polarity triggering and on negative incorporation. The apparent paradox signalled by the mutual consistency of (15a,b) is resolved by taking the negation in (15b), as distinguished from that in (15c), as an instance of metalinguistic use:[3]

(15) a. Max has three children—indeed, he has four.
b. Max doesn't have three children—(*but) he has four.
c. Max doesn't have three children, (but) he has two.

If Max has four children he does, a fortiori, have three, but if I know he has four I can reject the previous claim that he has three as (not false but) insufficiently informative.

Further real-life negations of the upper bound of scalars are listed in (16):

---

[3] Constraints on the distribution of *but* as reflected in these examples are discussed in Horn 1989: §6.4.3.

(16)a. Around here, we don't LIKE coffee, we LOVE it.
(Lauren Bacall, TV commercial for High Point decaffeinated coffee)
b. That wasn't a bad year, it was HORRIBLE.
(Reggie Jackson, on his subpar 1983 season with the Angels)
c. I'm not HAPPY he's gone—I'm elated. Never has an assistant coach gotten so much credit...
(Chicago Bears football coach Mike Ditka, on departure of former assistant Buddy Ryan to become head coach for Eagles in 1986)
d. I have two homes and I don't dig my roots into one or the other. I dig them into both. (12-year old girl, on her joint custody, N. Y. Times, 3/25/84)
e. It's not a car, it's a Volkswagen. (VW commercial and advertisement)
f. EN NEW HAVEN NO ME GUSTA...ME *ENCANTA* RADIO MUSICAL
(Ad on rear of Connecticut Transit buses in New Haven)

In each case, there is a sense that the speaker is inducing a contradiction on the first interpretive pass in order to achieve a special effect of irony or surprise. I'll return to this below.

What is said—now

This halcyon picture, with its pristine separation of what is said from what is meant, was never as pure as I have portrayed it. Even for Grice, propositional content is not fully fleshed out until reference, tense, and other deictic elements are fixed.[4] But with the development of Relevance Theory (Sperber & Wilson 1986), expanding on earlier observations of Atlas (1979), it came to be recognized that the same pragmatic reasoning used to compute implicated meaning must also be invoked to fill out underspecified propositions where the semantic meaning contributed by the linguistic expression itself is insufficient to yield a proper accounting of truth-conditional content.[5] Thus Carston (1985a: 6), citing the natural interpretation of sentences like those in (17),

(17)a. The park is some distance from where I live.
b. It'll take us some time to get there.

argues that what is said must be computed via the Principle of Relevance. It is not sufficient to take the appropriate understanding of the distance or time communicated by the speaker to be derived as an implicatum to be read off the underspecified content directly contributed by linguistic meaning alone, resulting in an existential proposition that would seem to have to be trivially true. Instead, the pragmatically recoverable strengthened communication comprises what is said, the EXPLICATURE or truth-conditional content. More generally, 'Just because something is pragmatically derived it is not necessarily an implicature' (op. cit.: 4), and indeed, cases like those in (17) represent the rule rather than the exception: 'There is massive pragmatic penetration of explicit content' (op.cit.: 6). Nor does the acceptance of widespread pragmatic intrusion into propositional content result in an erosion of the boundary between semantics and pragmatics:[6]

---

[4] Carston (1985a,b, 1988) sees Grice as including the resolution of ambiguity and vagueness as additional components in the determination of what is said, but it's debatable whether Grice would have endorsed this position. (See Atlas 1990 for discussion.)

[5] Similar views were earlier put forward by Lewis (1979) in his elaboration of the notion of pragmatic accommodation.

> Linguistic semantics is autonomous with respect to pragmatics; it provides the input to pragmatic processes and the two together make propositional forms which are the input to a truth-conditional semantics. (Carston 1988: 176)

Thus, both one-sided and two-sided understandings of the scalar predications of (1a-e) are directly represented at the level of logical content. That no privileged status accrues to the 'at least n' understanding of cardinal predications in particular is illustrated by Carston through examples those below.

(18)a. Mrs. Smith does have three children.
  b. If Mrs. Smith has no more than three children we'll all fit into the car.
  c. If Mrs. Smith has (at least) three-children, she qualifies for this program.
(19) If there are three books by Chomsky, I'll buy them all.
(20)a. She can have 2000 calories a day without putting on weight.
  b. The council houses are big enough for families with three kids.

The cardinal in (18) will be interpreted as either 'at most three' or 'at least three', depending on whether the utterance comes as a response to (18b) or (18c) respectively. (19), on the other hand, receives an 'exactly three' understanding. And the contexts in (20), based on what we know about the world, are naturally read as forcing 'at most n' understandings.

One apparent dividend promised by the explicit content view of the upper-bounding of scalar predications is that the 'paradoxical' negations of (14) and (16) need no longer present a problem or call for any sort of duality of negation. Rather, such examples

> can and naturally are interpreted as straightforward cases of descriptive negation. The conclusion that there is a lot more truth-conditional ambiguity than is contributed by the language in question is unavoidable. (Kempson 1988: 88)

---

[6] A collection of apparent counterexamples to the semantic autonomy thesis was earlier exhibited by Gazdar (1979: 164-68), despite his celebrated advocacy of the now abandoned formula 'Pragmatics = meaning - truth conditions'. (Cf. Kempson 1986 for related discussion.)

While the scalar predications of (1) are now all taken to be ambiguous, the ambiguity is no longer, as in the bad old days, located at the lexical level but has been relocated to the propositional level: what is SAID in an utterance is systematically underdetermined by what is UTTERED.

While endorsing Kempson's pragmatic enrichment analysis of scalar predications, Carston acknowledges that the paradoxical negations of (14) have a strong metalinguistic or echoic flavor that renders them unreducible to ordinary descriptive readings. In particular, she cites the negations of (21), in which the explicit content required by the context takes the scalar predication in the first clause to be strictly lower-bounded (with or without the overt presence of 'at least'), but the marked, metalinguistic reading of negation is still possible and, given the continuation, in fact necessary.

(21)a. You don't have to be (at least) SIXTEEN to drive a car;
you have to be (at least) EIGHTEEN.
b. You don't need (at least) TWO A's to get into Oxford;
you need (at least) THREE.

Given that a straightforward descriptive analysis is contraindicated for the negations in (21), she concludes that 'What we have in these cases is plain ordinary truth-functional negation operating over an echoic use of language' (Carston 1985a: 17).[7] But any such attempt (and see van der Sandt 1991 for a related one) to propositionalize not only upper-bounding implicata but the stylistic, connotative, and mechanical aspects of utterances that fall within the scope of marked negation, as in (6)-(12), would seem to be self-defeating, representing a kind of category mistake: an 'echoic use' is not the sort of beast to which a truth-functional operator applies.

Cardinal *Sinn* ?

Be that as it may, Carston's broadside is striking for its concentration on those scalar predications involving cardinals. Cardinals certainly seem to be a promising place to begin any brief for an explicit content approach to scalar predication. Indeed, as I shall argue briefly and somewhat programmatically here, while a strong case can be made for an enrichment analysis of the meaning contribution of the cardinals, it does not extend in any linear fashion to other scalar values.

---

[7] The notion of echoic negation itself is in need of clarification, since some of our clearly non-propositional examples (e.g. (7) and (12)) require a purely utterance-based notion of echo, while others, as in (i), demand a certain degree of propositionalizing, at least insofar as deixis and tense are concerned.

(i) A: So, I heard you were Robbie's brother.
B_1: I'm not HIS brother, HE's MY brother! (=(9c))
B_2: #You weren't HIS brother, HE was YOUR brother!

First, as Sadock (1984: 142-43) has observed, a minimalist (Grice-Hornian) theory of the cardinals will encounter insuperable difficulty when applied to the truth conditions of such mathematical statements as *2 + 2 = 3* or *The square root of 9 is 2*, each of which would have a true reading on the 'at least' understanding of the cardinals involved *(2 plus 2 is not only 3—it's 4!)*. It is plausible, as Atlas (1990) has suggested, that mathematical values are simply lexically distinct from the corresponding numeral words of natural language, which themselves are unspecified as among their 'exactly n', 'at least n', and 'at most n' values.

Another special property associated with the cardinals but not the 'inexact' quantificational values is the context-induced reversibility of the scales induced, as illustrated in Carston's examples in (18) and (20) but also acknowledged in some from Horn 1972, reproduced here for their historic value:

(22)a. Arnie is capable of breaking 70 on this course, if not {65/*75}.
  b. U.S. troop strength in Vietnam was down to 66,300, thus exceeding Mr. Nixon's pledge of 69,000.
  c. That bowler is capable of a round of at least 100. [and maybe even 110]
  d. That golfer is capable of a round of at least 100. [and maybe even 90]

Context-induced scale reversal is also discussed by Hirschberg (1985: §5.1.4) and Koenig (1991); the key point, however, is that these effects do not extend to the inexact scalar values: 'it does not seem possible to use *some*, for example, in such a way as to implicate "at most some"' (Sadock 1984: 143).

A related factor affecting the interpretation of cardinals but not extending to other scalars is the role of approximation. *I have $200* is far more likely to be read on its non-upper-bounded, minimal reading than is its unrounded counterpart *I have $201.37*, where Quantity interacts crucially with the Maxim of Relation: (Horn 1972: 45; cf. also Sadock 1977, Wachtel 1980 on the pragmatics of approximation).

Even when a traditional scalar line on the cardinals does seem tenable, it largely disappears under incorporation (Horn 1972: 37-8; cf. Hirschberg 1985: §5.1.4, Atlas 1990). An n-sided figure is one that is semantically constrained to have exactly (not at least) n sides. Thus, a square may count as a figure with three sides but it does not thereby qualify as a three-sided figure, much less as (at least) a triangle. A triple (three-base hit) is not (at least) a double (two-base hit), although the list of players with two base hits in a game may include those with three. Nor do we reckon a piece Schubert composed for eight wind instruments among his quartets.

Atlas (1990: 7-9) argues persuasively that the 'exactly n' interpretation of incorporated cardinals is to be linked to the collective or group readings which themselves systematically exclude minimalist treatment. This extends to the reading of Carston's (19) above, as Atlas points out, citing the contrast between that sentence and its distributive (and scalar-implicating) counterpart:

(23)a. If there are three books by Chomsky in the shop, I'll buy them all. [= (19)]
b. If there are three books by Chomsky in the shop, I'll buy each of them.

Koenig independently notes the 'exactly n' interpretation of sentences like *Three boys carried a sofa up the stairs (*in fact four)* and comes to the same conclusion: 'only distributed readings of count phrases give rise to scalar implicatures' (Koenig 1991: 4).[8]

But once again this correlation, valid as is it for the cardinals, does not readily generalize to the other scalars. Nor does the correlation of focus intonation with non-monotone cardinal readings observed in work by Fretheim (1991) and Rubinoff (1987). Fretheim notes that in response to A's query in (24), the B_1 response is compatible with an 'at least' reading, as the continuation indicates, but the B_2 response must be taken as SAYING, and not just IMPLICATING, that B has exactly three children.

(24) A: How many children do you have?
B_1: I have three children. (...In fact I have four.)
B_2: Three. (...#In fact four.)

Along the same lines, Campbell (1981: 97-99) notes that the upper-bounding implicatum derived in the context of (25) is CRYPTIC or automatic, requiring 'no real conscious effort' on A's part (as to whether B meant 'exactly two' or 'at least two'), while the context in (25') suggests that the addressee applies a PHENIC or conscious inferential mechanism to determine whether an implicature is present.

(25)A: How many children do you have?
B: Two.

(25')A: Do you have two children?
B_1: No, I have three.
B_2: Yes, in fact I have three.

While I have suggested (Horn 1989: 251-52) that Campbell's cryptic/phenic distinction might be subsumed within the descriptive scope of Morgan's notion of SHORT-CIRCUITED CONVERSATIONAL IMPLICATURE (Morgan 1978), an alternative account would take B's response in (i) to build upper-bounding into what is said as part of the EXplicature.

Once again, however, the facts change when we shift to other scalars:

---

[8] The most detailed formal treatment of the enrichment of content by uniqueness is due to Kadmon (1987, 1990), who provides an account of how upper-bounding can be accommodated into the discourse representation structure associated with a given utterance if the context—and in particular the presence of a definite anaphoric pronoun—requires.

(26)A: Do you have two children?
B_1: No, three.
B_2: ?Yes, (in fact) three.

(26')A: Are many of your friends linguists?
B_1: ?No, all of them.
B_2: Yes, (in fact) all of them.

Further, notice that a bare *'No'* answer, sans rectification, is compatible with a non-monotone ('exactly n') reading in (26) given an appropriate context, but never in (26'), where an unadorned negative response can only be understood as conveying less than many'.

Similarly, if (1e) were really propositionally ambiguous, there is no obvious reason why a *'No'* response to the question *'Is it warm?'* should not be interpretable as a denial of the enriched, two-sided content and thus as asserting that it's either chilly or hot, nor any non-ad hoc account of why we cannot (at least as adults) use the comparative in *'It's getting warmer'* to denote 'less hot' instead of 'less cold'. Such paradigms suggest that scalar (non-cardinal) adjectives are indeed lower-bounded by their literal content and upper-bounded, if at all, by implicature.

In sum, while we can accept Atlas's argument (1990: 15) that 'only in the context of an NP does a numeral modifier have a meaning', no analogous conclusion follows for the full range of scalar values. The signs point to a mixed theory in which sentences with cardinals may well submit naturally to a post-Gricean pragmatic enrichment analysis of what is said, while other scalar predications continue to submit happily to a neo-Gricean minimalist implicature-based treatment.

The said and the meant

The distinction between the said and the meant, and thus between the said and the implicated (the unsaid-but-meant), has a long and distinguished history, one which dates back at least to the fourth century, when rhetoricians characterized litotes, the figure of pragmatic understatement, as a figure in which we say less but mean more (cf. Horn 1991 for discussion):

> ...figura est litotes, quae fit, quotiescumque minus dicimus et plus significamus, per contrarium intelligentes (Servius, cited in Hoffmann 1987: 29)
> ...minus...dicit quam significat (Donatus, cited in Hoffmann 1987: 28)

Somewhat more recently, as we have seen, the Londoners and their allies have redrawn the map on which the territories of the said and the implicated are plotted. The determination of what is said is now recognized as a far more complex and crucially pragmatic matter than on the standard Gricean cartography. In a recent paper, Récanati takes another look at scalar predication and seeks to open a new front against the embattled traditionalists on behalf of the trans-Channel consortium. I cite the relevant passage in full:

> Everybody would agree that the saying/implicating distinction is part of the ordinary, everyday picture of linguistic communication. We commonly talk of what is 'said' as opposed to what is 'implicated' by means of a certain utterance, and it is that distinction which Grice undertook to elaborate...[But] when the domain of Grice's theory of implicatures was extended far beyond our intuitive reach, this was hardly noticed, let alone considered to raise a problem. Not many people have observed that Grice's theory departs from our intuitions when it is applied to examples such as 'John has three children', which Griceans take to express the proposition that John has at least three children and to implicate that he has no more than three children. However, there is an important difference between this example and *e.g.* 'I've had no breakfast today', which implicates that the speaker is hungry and wishes to be fed. In the latter example, the implicature is intuitively felt to be external to what is said; it corresponds to something that we would ordinarily take to be 'implied'. In the former case, we are not pre-theoretically able to distinguish between the alleged two components of the meaning of the utterance—the proposition expressed (that John has at least three children) and the implicature (that he has at most three children). We are conscious only of their combination, *i.e.* of the proposition that John has exactly three children. In this case..., the theoretical distinction between the proposition expressed and the implicature does not correspond to the intuitive distinction between what is said and what is implied. (Récanati 1989: 326)

But just how compelling is this argument from intuition? As an avatar of the anti-Grice, Récanati—like Kempson, Carston, Atlas, and Koenig—judiciously concentrates his fire on our weakest flank, the cardinals. An inspection of the literature on the scalars, in particular the weak positive (upward monotone) determiner *some*, indicates that Grice must be seen as a Paulie-come-lately to an unusually well-established consensus. The distinction between what an expression or its utterer SAYS and what an expression or its utterer MEANS is standardly evoked by nineteenth-century philosophers seeking to preserve the classical analysis of *some* against the lexical-ambiguist line urged by Sir William Hamilton of Edinburgh and his successors (cf. Horn 1990a). In these passages, the emphasis is mine but the proto-Gricean terminology is in the original.

> In common conversation the affirmation of a part is meant to IMPLY the denial of the remainder. Thus, by 'some of the apples are ripe', it is always [sic!] INTENDED TO SIGNIFY that some are not ripe.
> (De Morgan 1847: 4)
>
> *Some*, in logic, means *one or more, it may be all*. He who says that *some are*, is not to held to mean the rest are not. 'Some men breathe'...would be held false in common language [which] usually adopts the complex particular proposition and IMPLIES THAT SOME ARE NOT IN SAYING THAT SOME ARE. (De Morgan 1847: 56)

> No shadow of justification is shown...for adopting into logic a mere sous-entendu of common conversation in its most unprecise form. If I say to any one, 'I saw some of your children today', he might be justified in inferring that I did not see them all, NOT BECAUSE THE WORDS MEAN IT, but because, if I had seen them all, it is most likely that I SHOULD HAVE SAID SO: even though this cannot be presumed unless it is presupposed that I must have known whether the children I saw were all or not. (Mill 1867: 501)

> Whenever we think of the class as a whole, we should employ the term All; and therefore when we employ the term Some, IT IS IMPLIED that we are not thinking of the whole, but of a part as distinguished from the whole—that is, of a part only. (Monck 1881: 156)

Sapir's particular propositions are also unilateral in content, picking up a bilateral force only as context permits:

> 'Not everybody came' DOES NOT MEAN 'some came', WHICH IS IMPLIED, but 'some did not come'. Logically, the negated totalizer [not every] should include the totalized negative, i.e. opposite or contrary [none], as a possibility, but ORDINARILY this interpretation is excluded. (Sapir 1930: 21)

A more detailed defense of this position is offered by an unfortunately obscure philosopher writing in an equally obscure Jesuit journal:

> WHAT CAN BE UNDERSTOOD WITHOUT BEING SAID is usually, in the interest of economy, NOT SAID…A person making a statement in the form, 'Some S is P', generally WISHES TO SUGGEST that some S also is not P. For, in the majority of cases, if he knew that all S is P, he would say so...If a person says, 'Some grocers are honest', or 'Some books are interesting', meaning to suggest that some grocers are not honest or that some textbooks are not interesting, he is really giving voice to a conjunctive proposition in an elliptical way.
>
> Though this is the usual manner of speech, there are circumstances, nevertheless, in which the particular proposition should be understood to mean just what it says and not something else over and above what it says. One such circumstance is that in which the speaker does not know whether the subcontrary proposition is also true; another is that in which the truth of the subcontrary is not of any moment. (Doyle 1951: 382)

So, pace Récanati, the analysis of the prototypic weak scalars as asserting a lower bound and suggesting or implying—i.e. implicating—an upper bound as a contextually dependent aspect of meaning is among the more robust intuitions in the literature. Of course, this does not vitiate the appeal of an explicature analysis for a particular construction; we have observed that precisely such an approach seems warranted for the cardinals. We turn now to *only* sentences, where I shall argue that the adoption of an enrichment analysis allows us to arrive at a semantically economical account of the linguistic contribution made by *only*.

Only and {im/ex}plicature

Through the millenia there have been two primary approaches to the semantics of *only*. The primary treatment is contained in the thirteenth century treatise on exponibles by Peter of Spain, on which an 'exclusive' expression with the syncategorematic term *solus* or *tantum* ('alone', 'only') is a conjunction that can be expounded (unpacked) into 'an affirmative copulative proposition whose first part is that to which the exclusive sign was prefixed, and whose second part is a negative proposition denying the predicate of all others apart from the subject' (Mullally 1945: 106-7). Thus (27a) entails the conjunction of (26b) and (26c).

(27)a. Only man is rational.
b. Man is rational.
c. Nothing other than man is rational.

More recent advocates of a Petrine conjunction analysis for sentences with *only* or an 'exceptive' like *nothing but*... include Kuroda (1966), Lakoff (1970), Taglicht (1984), Keenan & Stavi (1986), Atlas (1991), von Fintel (to appear), Moser (1992), Burton-Roberts (1992), and Krifka (1992). But does (27a) really SAY (27b) as well as (27c)? And is it the *only* that says it? Here is Peter's contemporary, William of Sherwood:

> It is asked why 'alone' *[solus]* is called an exclusive rather than an inclusive; for when someone says 'Socrates alone is running', Socrates is included under running but the others are excluded. It must be said that it is because the inclusion occurs not as a result of the force of the word but as a result of the statement as it is before the 'alone' is inserted into it. The exclusion, on the other hand,...does occur as a result of the force of the word ['alone'].
>
> (*Treatise on Syncategorematic Words* XI.6, in Kretzmann 1968: 71-2)

This suggests an asymmetric approach on which the positive proposition, e.g. (27b), is not said, or at least not said directly.[9] Along these lines, my own somewhat dusty analysis can be demothballed to reveal a positive presupposition and a negative assertion:

(28) Horn (1969): only (x=a, Fx)
Presupposes: Fa
Asserts: $\sim\exists y(y \neq a \ \& \ Fy)$

---

[9] I read Thomas Aquinas (*Summa Theologica* Ia, q. 31, arts. 3 and 4, in Pegis 1945: 311-14) as endorsing a similarly asymmetric position on *only*, although it's possible that with Peter of Spain, who later became Pope John XXI, among the conjunctionalist hosts, I just want to recruit a saint to my side of the ledger for moral support.

Thus *Only Muriel voted for Hubert* (and doesn't that take us back?) presupposes that she did and asserts (and entails) that nobody else did. Crucially, (29a) is distinguished from the true conjunction (29b) which really does simply entail both its positive/(29c) and negative/(29d) components.

(29)a. Only Muriel voted for Hubert.
b. Muriel and only Muriel voted for Hubert.
c. Muriel voted for Hubert.
d. Nobody distinct from Muriel voted for Hubert.

Indeed, one unresolved problem for any conjunctionalist account of *only* is how to explain why (29b) is distinct from (29a) and not simply redundant.

My evidence for the essentially negative character of sentences like (29a) was provided by the possible and impossible continuations in (30). (To the original examples from Horn 1969, 1970 in (30a-e), reproduced here for their nostalgic value, I add the new ones in (f-h) with the expectation that the current paper will seem equally dated in another 23 years.)

(30)a. —Did only Muriel vote for Hubert?
—No, {Lyndon did too/#she didn't}.
b. —Only Muriel voted for Hubert.
—No, that's not true: {Lyndon did too/#she didn't/#nobody did}.
c. Only John smoked the pot, {{if even he did/and maybe even he didn't.}
#if nobody else did.
#and/but maybe someone else did. }
d. Nobody but Nixon is worthy of contempt, and possibly even he isn't.
e. Everybody but Nixon is worthy of salvation, and possibly even he is too.
f. Only Hillary would ever trust Bill.
g. Only if he runs against George would I vote for Bill.
h. 60% of the men {but/?and} only 40% of the women voted for George.

The argument here (Horn 1969: 105; cf. also Ducrot 1973 on the scale-reversing properties of *seulement)* is that entailment (as reflected in constraints on cancellation or suspension), polarity effects, and monotonicity diagnostics (cf. Barwise & Cooper 1981) are determined by the assertion alone—what is said—and not by what is presupposed or implicated.

A similar analysis is proposed in Horn 1979, except that the positive or existential component (e.g. (29c)) is now taken to follow from the *only* sentence by CONVENTIONAL IMPLICATURE à la Grice 1975 and Karttunen & Peters 1979, rather than representing a truth-value-gap inducing logical presupposition. Rooth (1985) adopts the same line, although he disregards the implicated component in the implementation of his semantics. Data like those in (31), applying Karttunen-Peters-type diagnostics to *only* sentences,

(31)a. If only Hillary trusts Bill, all is well.
b. I just discovered that only Hillary trusts Bill.
c. It's too bad that only Hillary trusts Bill.
d. I know Hillary trusts Bill, but does ONLY Hillary trust Bill?
e. #I know nobody besides Hillary trusts Bill, but does only Hillary trust Bill?

suggest that *Only Hillary trusts Bill* does indeed (at most) conventionally implicate, and not say, that Hillary trusts Bill. The fact that the positive proposition falls outside the scope of the assertion in each case reinforces the view that we are dealing with a non-truth-conditional aspect of conventional meaning.[10] But are we? Or is a more unconventional analysis called for?

A rigidly minimalist stance on *only* is advocated by Geach (1962: 187), for whom there is NO relation between the *only* expression and its positive counterpart. Thus 'F (some α)' is not deducible from 'F (only α)' either as an entailment or as a non-truth-conditional aspect of conventional force. Geach's argument for this analysis from logical convenience—'It is formally much more convenient to treat the exclusive proposition as having precisely the exclusive force of its supposed second [negative] component'—appears to fly in the face of intuition, entailing as it does that *Only the President can rectify the Rodney King verdict* is true on the grounds that NOBODY can rectify the Rodney King verdict. But what if we can derive the positive proposition as a CONVERSATIONAL implicature?

All things equal, we should prefer a Geach-type account. An appeal to conventional implicature is an admission of analytic defeat, suggesting that the lexical semantics could be otherwise: conventional implicata may be implicata, but they are also conventional. In fact, though, we've seen that the positive component of a sentence with an exclusive or exceptive can be cancelled in context (recall (30c,d,e))[11], and as (32) shows, the implicature in question appears to be non-detachable as well, two arguments for its non-conventional status.

(32) Only Democrats support Brown.
Nobody {but/except/other than} Democrats support Brown.

To make the case, however, we need a demonstration of calculability: how can the positive component of *only* sentences be derived as a conversational implicatum? Here we follow an argument of McCawley (1981: 226), as well as independent suggestions along the same lines by de Mey (1991) and Hoeksema (1991): it is pointless to weaken a statement predicating something universally if you know that the predication holds for the excepted elements as well. If you know—or even strongly suspect—that NOBODY supports Brown, (32) is a pretty silly way of conveying this. Note in addition that (32) does not implicate that Democrats support Brown, but only that some do.

---

[10] If the semantics of *only if* are compositional, they reinforce the conclusion that the positive proposition is not entailed, or *p only if q* would be equivalent to *p if and only if q*, which it clearly is not: *I'll go (#if and) only if you do and maybe not even then.* But the distinction between *only if* and *if and only if* is parallel to that between *only linguists* and *linguists and only linguists*.

[11] Or the classic exceptive in (i),

(i) All the world is queer save me and thee, and sometimes I think thee is a little queer.

attributed by Bartlett et al. to 'an unidentified Quaker speaking to his wife'. As in the other examples of felicitous cancellation, the presence of an epistemic qualifier is essential.

The key here lies in the converse relation between *only* and *all*, recognized by the medievals ('Tantum animal est homo ergo omnis homo est animal': Peter/Mullally 1945: 106-7) and more recently exploited by Löbner (1987) and de Mey (1991). To say that only Democrats support Brown is to say that all Brown supporters are Democrats. But, as has been recognized for a couple of millenia (cf. Horn 1989: §1.1.3 for discussion), there is an existential inference, generally assumed to hold non-logically, that is typically associated with universals. Thus we can pragmatically infer that there are indeed Brown supporters; otherwise the *all*-statement would be informationally vacuous and hence pointless to assert. But now we obtain that conclusion that there are indeed Democrats who support Brown, which is the strongest positive proposition licensed by (32). Another way to put the same point is that it's just as true, but just as uncooperative, to assert (32) if you know that nobody supports Brown as it is to assert that all Jack's children are bald on the grounds that Jack is childless.

Thus I claim that whenever something is predicated of an entire contrast set with a specified excluded or excepted subset, the complementary property is conversationally implicated to hold of the exception, modulo assumptions of relevance and knowledge. This position is reminiscent (at least to me) of one defended elsewhere (in Horn 1981) advocating that the cleft in (33a), while conventionally implicating the backgrounded existential proposition in (33b), does not conventionally implicate (33c) or (33d), contra Halvorsen 1978, and does not entail or assert (33c), contra Atlas & Levinson 1981 (and now Aissen 1992: 50-51).

(33)a. It was a pizza that Mary ate.
b. Mary ate something.
c. Mary ate nothing (within the context set) other than a pizza.
d. Mary ate at most one thing (within the context set).

Rather, as the non-detachability paradigm in (34) indicates,

(34)a. What Mary ate was a pizza. [psuedo-cleft]
b. The thing that Mary ate was a pizza. [*th*-cleft]
c. Mary ate a PIZZA. [focus intonation]
d. A PIZZA, Mary ate. [focus- or Y-movement]

the exhaustiveness premise associated with clefts and other focus constructions is derivable as a generalized conversational implicature. That is,

> The utterance in context C of any sentence which entails $F\alpha$ and conventionally implicates $\exists x(Fx)$ will induce a generalized conversational implicature to the effect that $\sim\exists x(x \neq \alpha \ \& \ Fx)$, where the variable x ranges over entities determined by C. (Horn 1981: 134)

Without going through the details of that argument (cf. Vallduví 1990 for a recent concurring opinion), I shall merely note here that on the account proposed here, (35b) does not follow from (35a) by virtue of semantics, just as (35d) does not follow from (35c).

(35)a. I love only you.
b. I love you.
c. I love YOU.
d. I love nobody distinct from you.

That is, *I love only you* is not a declaration of love nor *I love you* a declaration of fidelity, but the recipient in each case is pragmatically licensed to hope for the best.

Unfortunately for the symmetry of this picture and for the simplicity of the story proposed for *only* here, there are contexts in which an *only* sentence does seem to entail both of its components, as on the Petrine conjunction analysis:

(36)a. Mary will be upset if only Bill makes it to her dinner party.
b. I bet you $10 that only Kim passes the test.
c. Guess what: only Kim passed the test!

The contrast with the well-behaved implicata of *even* sentences is especially striking; in the parallel examples of (37) the scalar and existential implicata remain properly outside the scope of what is said.

(37)a. Mary will be upset if even Bill makes it to her dinner party.
b. I bet you $10 that even Kim passes the test.
c. Guess what: even Kim passed the test!

Thus if Kim passes the test, the speaker of (37b) wins the bet, if not not, regardless of whether others passed or whether Kim's success was particularly surprising.[12] What of (36b), though? If everyone flunked, no amicable settlement of the wager is at hand. Similarly, in (36a), Mary may just be apprehensive about an evening alone with Bill; if no one shows up at all she will happily pop a meal in her microwave and a tape in her VCR.

---

[12] On the standard Karttunen-Peters type analysis of *even* (Karttunen & Peters 1979: 23-33; cf. also Fraser 1971, Horn 1971), (i) conventionally implicates both (ii) and (iii).

(i) Even Kim passed the test.
(ii) There are other x under consideration besides Kim such that x passed the test.
(iii) For all x under consideration besides Kim, the likelihood that x passed the test is greater than the likelihood that Kim passed the test.

The problem is that on the natural interpretation of the sentences of (36), contrary to what we found earlier, *only* α... does indeed get interpreted as SAYING α *and only* α...[13] What we need here is precisely a Sperber-Wilson-Kempson-Carston type analysis in which the positive component, while not constituting part of the linguistic meaning contributed by *only*, DOES enter into the determination of what is said, the enriched propositional content. I submit that an asymmetric theory of the conventional meaning of *only* in the spirit of William of Sherwood and of Geach, combined with a Gricean approach to the positive or existential component and with a London-style account of the apparently recalcitrant cases, provides the most natural and least stipulative treatment of the full range of data.[14]

I would maintain, however, that only the latter implicature need be stipulated as conventional. First, the non-uniqueness inference in (ii) can be straightforwardly derived from the use of an expression that induces the scalar implicature in (iii) while making no other contribution to the content of the sentence in which it occurs. But in addition, Karttunen & Peters's 'existential implicature' can be cancelled in the appropriate context, such as the one observed by Bruce Fraser (p.c., 1971):

(iv) Come on, Chris, eat up—even little Billy finished his cereal.

(iv) can be uttered by a parent to an older child without implicating that anyone other than little Billy has eaten his cereal, provided that Billy is the less likely of the set of two to have done so. If this reanalysis is tenable, one more putative conventional implicature bites the dust.

[13] Sometimes this intended strengthening is not directly apparent to the beholder. I had to read a recent headline 'Lenin Belongs Only in a Museum—or Does He?' more than once to realize that the question had to do with whether Lenin belongs EVEN in a museum.

[14] One crucial aspect of the context in determining the content of *only* expressions is the semantic type of the focus of *only*. De Mey (1991: 102-4) acknowledges that the pure conversational line he tentatively endorses for the existential proposition is most convincing for CN subjects like (i), less so for proper names as in (ii), and least of all for cardinal foci as in (iii); an epistemological account of the difference seems plausible, but I cannot pursue this here.

(i) Only students (if anybody at all) read books.
(ii) Only John (if anybody at all) slept.
(iii) Only three pilots (if anybody at all) slept.

For William of Sherwood, too, the truth-conditions of an *only* sentence will depend on the context, but he is particularly sensitive to the effect of distributive vs. group readings of *only n* subjects, pointing out (Kretzmann 1968: 95) that while generally, 'If one says "only three", one cannot infer "therefore not two", but instead "therefore not four or five"', as in (iv),

(iv) Only three are running.
(v) Only three are hauling the boat.

The Cloud of Unsaying

In the cases examined so far, what is said is contrasted with what is meant without being said: some things must be said, some things are better left unsaid. But there are also those things that a speaker must unsay. It is to this reversative category of the unsaid that we now turn.

We observed rather briefly above the double processing effect associated with some examples of marked negation[15], an effect emerging even more clearly in the opening paragraph of a late 1984 New York Times op-ed column by television news commentator John Chancellor, in which what is said must first be constructed and then, when the final sentence is reached, deconstructed:

> When Ronald Reagan carried 49 states and won 525 electoral votes, it was not an historic victory. Walter F. Mondale's poor showing wasn't an historic defeat. Mr. Mondale's choice of Geraldine A. Ferraro as his running mate wasn't an historic decision, either. None of these was an historic event. Each was a historic event.

Only the rectification forces this reanalysis, in which what is said must retroactively be unsaid. A parallel instance occurs in a passage from *Othello* (III.iv) in which the words Bianca puts into Cassio's mouth

---

both upper and lower bound are excluded in (v), which can only be read as saying that exactly three are engaged in boat-hauling. The link between propositional enrichment and group readings with *only* recalls the parallel correlation for basic cardinal predications observed earlier.

[15] I have argued elsewhere (Horn 1989: 484-90, Horn 1990: 496ff.) that the set of metalinguistic negations inducing double processing is not truth-conditionally homogeneous, contra Burton-Roberts 1990 (and vitiating the criticism in Wiche 1991). In just those instances in which the the focus of negation involves a truth condition for the corresponding affirmative, including in particular the primal datum,

(i) The king of France is not bald. [as uttered post 1870]

the very act of issuing a METALINGUISTIC negation suffices to render the sentence true as a DESCRIPTIVE negation. Thus, even though such a denial is most naturally uttered as an echoic objection to an earlier positive assertion, it differs from our earlier examples in that no truth-conditional contradiction arises in the processing of the negative utterance. When the objection focuses on a conventional implicatum that is NOT a truth condition of the affirmative, as in the examples in Note 2 above, on the other hand, the use of metalinguistic negation fails to guarantee the truth of the corresponding descriptive negation. The disunity of the class of metalinguistic negations is demonstrated by the distribution of *because* clauses, where infelicity results only when an utterance is objected to on purely non-truth-conditional grounds:

(ii) The king of France isn't bald, (because) there is no king of France.
(iii) I'm not his brother, (#because) he's my brother!
(iv) I didn't trap two monGEESE, (#because) I trapped two monGOOSes.
(v) Grandpa isn't feeling lousy, Johnny, (#because) he's just indisposed.

Cf. Burton-Roberts 1989: 237 and Horn 1990b: 499-500 for two sides to this story.

Cassio: Leave me for this time.
Bianca: Leave you? Wherefore?
Cassio: I do attend here on the general
And think it no addition, nor my wish
To have him see me womaned.
Bianca: Why, I pray you?
Cassio: Not that I love you not.
Bianca: But that you do not love me!

serve to convert the descriptive negation of his protest into a quibble over *do*-support: it's not that I love you not, it's that I don't love you. And when Joan Rivers, in an April 22, 1992 address to Yale undergraduates on 'Life in the Real World', reminds Yale students,

> Remember, kids. It's not who you know, it's WHOM you know.

double processing strikes again.

Parallel to the Chancellor, Shakespeare, and Rivers citations is the scalar implicature-cancelling negation in Hungarian, where Varga (1980: 90) observes that contrarily to the ordinary lower-bound-denying negation of (38a),

(38)a. `Nem `olyan gyorsan gépel mint te. — 'He doesn't type as fast as you'
not as fast types as you — (=he types more slowly)
b. `Nem ᵛolyan gyorsan gépel mint te, hanem `gyorsabban. — 'He doesn't type as fast as you, but faster'

the marked negative utterance in (38b)

> may have a surprising or humorous effect (because it contradicts our pragmatic expectations mobilized by the first part of the sentence), but is perfectly acceptable...The lower-value ['less than'] interpretation prevails unless the higher-value interpretation is explicitly stated.

Similarly, (39) is processed as 'a pragmatic contradiction...exploited to create a surprising and/or humorous effect'.

(39) `Nem ᵛolyan magas Ø, mint te, hanem `sokkal `magasabb Ø.
not as tall is as you but much taller is
'He isn't as tall as you, he's much taller'

This sense of irony, surprise, or humorous affect accompanying the double processing induced here is worth stressing. Earlier accounts of metalinguistic or marked negation, like Jespersen's (cited above) or mine, as when I comment that 'There is a procedural sense in which the descriptive use is primary: the...metalinguistic understanding is typically only available on a "second pass", when the descriptive reading self-destructs' (Horn 1989: 444), fail to deal adequately with this affect and hence to assimilate the marked negations of these cases to other modes of ironic unsaying. Yet the effect is not surprising, especially in the light of the echoic theory of irony (Sperber & Wilson 1986).

To illustrate, I'll consider three distinct devices for triggering ironic reprocessing. First, as we see in (40), the formula 'No X, no Y' may be filled in—depending on context and contour—either conjunctively or conditionally:

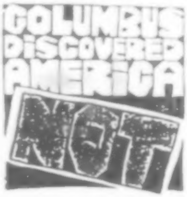
(40) a. No retreat, no surrender. No smoking, No drinking. ($\varphi \& \psi$)
b. No pain, no gain. No tickee, no washee. ($\varphi \rightarrow \psi$)

Even here, the context is paramount in determining context: 'No vegetables, no dessert' will be taken as a conditional or a conjunction depending on whether it's uttered as a parent's warning or a maitre d's apology. But the sign posted on the Yale Commons cafeteria door reproduced in (41) must first be assigned conditional content; only at the bottom does this content get erased and replaced by that of a loony conjunction.

(41) NO SHIRT, NO SHOES
NO SERVICE

ALSO—NO SKATES

But my retroactive negation of choice is the ubiquitous if notorious ...NOT of Wayne's World fame, as is now appearing on a T-shirt near you, to honor the local namesake on his quincentenary:



What especially drew my attention to retro-NOT is its apparent conflict with the well-established functional tendency for natural language negation to precede its focus, even when typological syntactic considerations militate against it. This NEG-FIRST principle, stressed by Jespersen and exemplified in Horn 1989, is motivated by the tendency to signal negation as early as possible, even at the cost of introducing ambiguity, to forestall potentially significant misinterpretations, especially in directive speech acts: 'Kill him—oops—not!' But it is precisely this cooperation-based motivation for EARLY negation that is exploited by the use of TOO-LATE negation of the garden-pathing, sarcastic genus. Thus the effect is quite parallel to that of the garden-variety garden-path echoic negations we have discussed, a parallel that especially struck me when my young son came out with the sequence in (42) a few months after his younger sister had hit me with the functionally parallel metalinguistic negation in (43):

(42) You're my favorite person. *(pause)*
NOT! *(shorter pause)* Just kidding!
(David H., 9:6)

(43) I don't like you, Daddy.
(pause) I love you.
(Meryl H., 6:6)

The history of retro-NOT, incidentally, is a bit longer than Wayne and Garth might suggest. In (44) we have a citation from Archie Goodwin in a mid-1950's Nero Wolfe mystery, and in (45) and (46) instances from a pre-war juvenile Western novel[16]—pre-World War I, that is—by the renowned author of *Tom the Telephone Boy, Two Boy Gold Miners,* and *The Boy Pilot of the Lakes:*

(44) I stood with my arms folded, glaring down at Nero Wolfe, who had his 278 pounds planted in a massive armchair...'A FINE WAY TO SERVE YOUR COUNTRY', I told him. 'NOT. In spite of a late start I get you here in time to be shown to your room and unpack and wash up for dinner, and now you tell me to go tell your host you want dinner in your room. Nothing doing. I decline.' (Stout 1955: 54)

(45) 'Larry, you and Bill build the fire and get supper ready. Horace, I'll put you in charge and you must arrange the place for us to sleep. I can see some pine trees yonder. Break off some limbs and spread them on the ground. Then put the blankets over them.'
'YOU'RE A FINE COMMANDER TO BE LIEUTENANT FOR—NOT', declared Horace. 'Gave me the meanest job of all.' Yet he lost no time in obeying. (Webster 1910: 68)

(46) 'HE'S A FINE NEIGHBOR—NOT', declared Larry. 'I should have thought he would be only too glad to help your father and Mr. Snider get back their cattle.' (Webster 1910: 145)

Notice that in each case the retroactive unsaying follows a previous affirmation involving the predicate *fine,* which may tip the reader off to the sarcastic intent in the same manner that the fall-rise contour does with metalinguistic negation. The recipient is warned to tread lightly on that garden path.[17]

One last example: while negative parentheticals normally follow a main clause negation and contribute a functionally pleonastic negative—*He isn't, I (don't) think, going to be able to make it today*—the negative parentheticals in (47) are very much NON-pleonastic, serving (like their retro-NOT cousins) to unsay what was said and install its contradictory.

---

[16] Retro-NOT seems to have a particular appeal to children and adolescents alike. Jack Hoeksema informs me that in Dutch, where ordinary *niet* occurs in pre-verbal position in canonical SOV clauses, retroactive *niet* has been innovated, either spontaneously by his 3-year-old daughter or via the pre-school grapevine. His daughter contributed the data in (i) and (ii), where the explosive negative is preceded by a telltale pause, the classic invitation to stroll down that garden path:

(i) Papa is lief—NIET! (standard Dutch: *Papa is niet lief.*) 'Daddy is sweet. NOT!'
(ii) Nette moet plassen—NIET! (vs. *Nette moet niet plassen.*) 'Annette must pee. NOT!'

[17] When the original content is itself negative, the retroactive negator cannot be NOT, but other alternatives are available:

(i) You don't please me when you squeeze me.
No, not much.

(47) 'Look here, kid', said R.C. [Grey's brother], 'save something for tomorrow.'
In disgust Romer [Grey's son] replied, 'Well, I suppose if a flock of antelope came along here you wouldn't move...YOU AN' DAD ARE GREAT HUNTERS, I DON'T THINK!'
(1918 Zane Grey memoir, Tonto Basin)

HARRY'S A REAL GENIUS, I DON'T THINK. (Cutler 1974: 117)

Once again, the patently insincere superlatives signal the undoing to come.

A final note on the fine art of unsaying. This device has a rich history in rhetoric. We find it mentioned by Steele in the Tatler:

> My Contemporaries the Novelists [i.e., journalists] have, for the better spinning out Paragraphs, and working down to the End of their Columns, A MOST HAPPY ART IN SAYING AND UNSAYING, giving Hints of Intelligence, and Interpretations of indifferent Actions, to the great Disturbance of the Brains of ordinary Readers. (Steele 1710: 469)

Even more striking is Vaughn's unmasking of this black art in his mocking vilification of the morally corrupt Romantics and their 'doctrine of Irony':

> After advancing a paradox, or pushing a fancy to the edge of absurdity, let the author turn round, and abandon his own creation...Thus, if any dullard begins gravely to criticise, he shall have only laughter for his pains, as one too gross for the perception of humour...According to the Ironic theory, such SAYING AND UNSAYING IS NOT CONVENIENT MERELY (as a secret door of escape behind the tapestry), BUT IN THE HIGHEST DEGREE ARTISTIC. For what is Art, but a sublime play? (Vaughan 1856: 346-47)

Of course, as Spurgeon (1882: 284) reminds us, we must be on our guard,

> for IT IS SO MUCH EASIER TO SAY THAN TO UNSAY.

NOT!*

References

Aissen, Judith. 1992. Topic and focus in Mayan. Language 68. 43-80.

Aquinas, St. Thomas. Basic writings of Saint Thomas Aquinas, ed. by A.C. Pegis. New York: Random House, 1945.

---

*Early versions of some of this material were presented in May 1991 at the DANDI colloquium on negation in Corsendonk, Belgium and at CREA in Paris and I am grateful to my hosts, Pieter Seuren and Dan Sperber, and interlocutors there and at SALT for their contributions. Thanks are also due, for the particular inspiration of their examples and discussion, to Noel Burton-Roberts, Georgia Green, Jack Hoeksema, Christine Kamprath, Bill Poser, Robert Richardson, Dale Savage, Kai von Fintel, and John Wildanger. I am of course liable for any misappropriation.

Atlas, Jay David. 1979. How linguistics matters to philosophy: Presupposition, truth, and meaning. In Oh & Dinneen, 265-81.

_____. 1990. Implicature and logical form: The semantics-pragmatics interface, Lecture 3. Manuscript of lecture delivered at Second European Summer School in Language, Logic and Information, Katholieke Universiteit Leuven.

_____. 1991. Topic/comment, presupposition, logical form and focus stress implicatures: The case of focal particles *only* and *also*. J. of Semantics 8. 127-147.

_____, and Stephen C. Levinson. 1981. *It*-clefts, informativeness, and logical form. Radical Pragmatics, ed. by Peter Cole, 1-61. New York: Academic.

Barwise, Jon, and Robin Cooper. 1981. Generalized quantifiers and natural language. Linguistics & Philosophy 4. 159-219.

Burton-Roberts, Noel. 1984. Modality and implicature. Linguistics & Philosophy 7. 181-206.

_____. 1989. The limits to debate: A revised theory of semantic presupposition. Cambridge: Cambridge U. Press.

_____. 1992. On preservation under negation. Ms., U. of Newcastle upon Tyne.

Campbell, R. N. 1981. Language acquisition, psychological dualism, and the definition of pragmatics. Possibilities and limitations of pragmatics, ed. by Herman Parret, et al., 93-103. Amsterdam: John Benjamins.

Carston, Robyn. 1985a. A reanalysis of some 'quantity implicatures'. Unpublished ms., U. of London.

_____. 1985b. Saying and implicating. Unpublished ms., U. of London.

_____. 1988. Implicature, explicature, and truth-theoretic semantics. Mental representations: The interface between language and reality, ed. by Ruth Kempson, 155-81. Cambridge: Cambridge U. Press.

Cutler, Anne. 1974. On saying what you mean without meaning what you say. CLS 10. 117-27.

de Mey, Sjaak. 1991. 'Only' as a determiner and generalized quantifier. J. of Semantics 8. 91-106.

De Morgan, Augustus. 1847. Formal logic. London: Taylor & Walton.

Doyle, John J. 1951. In defense of the square of opposition. The New Scholasticism 25. 367-96.

Ducrot, Oswald. 1973. La preuve et le dire. Paris: Maison Mame.

Fennelly, Tony. 1985. The glory hole murders. New York: Carroll & Graf.

Fogelin, Robert J. 1967. Evidence and meaning. New York: Humanities Press.

Foolen, Ad. 1991. Metalinguistic negation and pragmatic ambiguity: Some comments on a proposal of Laurence Horn. Pragmatics 1. 217-37.

Fraser, Bruce. 1971. An analysis of 'even' in English. Studies in linguistic semantics, ed. by Charles Fillmore and D.T. Langendoen, 150-78. New York: Holt.

Fretheim, Thorstein. 1992. The effect of intonation on a type of scalar implicature. To appear in J. of Pragmatics.

Gazdar, Gerald. 1979. Pragmatics. New York: Academic Press.

Geach, P. T. 1962. Reference and generality. Ithaca: Cornell U. Press.

Grice, H. P. 1961. The causal theory of perception. Proc. of the Aristotelian Society, Supplementary volume 35. 121-52.

_____. 1967. Logic and conversation: the William James lectures. Ms., Harvard University.

_____. 1975. Logic and conversation. Syntax and Semantics 3: Speech Acts, ed. by Peter Cole and Jerry L. Morgan, 41-58. New York: Academic Press.

Grote, George. 1872. Aristotle, Volume I. London: John Murray.

Halvorsen, Per-Kristian. 1978. The syntax and semantics of clefts. U. of Texas dissertation. (Texas linguistics forum 11.)

Harnish, Robert. 1976. Logical form and implicature. An integrated theory of linguistic ability, ed. by T. G. Bever, et al., 464-79. New York: Crowell.

Hirschberg, Julia. 1985. A theory of scalar implicature. U. of Pennsylvania dissertation.

Hockett, Charles F. 1978. In Search of Jove's Brow. Amer. Speech 53. 243-313.

Hoeksema, Jack. 1991. The semantics of exception phrases. Generalized quantifier theory and applications, ed. by Jaap van der Does and Jan van Eijck, 245-71.

Hoffmann, Maria. 1987. Negatio contrarii: A study of Latin litotes. Assen: Van Gorcum.

Horn, Laurence R. 1969. A presuppositional analysis of *only* and *even*. CLS 5. 97-108.

_____. 1970. Ain't it hard anymore. CLS 6. 318-327.

_____. 1971. Negative transportation: Unsafe at any speed? CLS 7. 120-133.

_____. 1972. On the semantic properties of logical operators in English. UCLA dissertation. Distributed by Indiana U. Linguistics Club, 1976.

_____. 1973. Greek Grice: a brief survey of proto-conversational rules in the history of logic. CLS 9. 205-214.

_____. 1979. *Only, even,* and conventional implicature. Paper presented at the annual meeting of the Linguistic Society of America, Los Angeles.

_____. 1981. Exhaustiveness and the semantics of clefts. NELS 11. 125-142.

_____. 1985. Metalinguistic negation and pragmatic ambiguity. Language 61. 121-74.

_____. 1989. A natural history of negation. Chicago: U. of Chicago Press.

_____. 1990a. Hamburgers and truth: Why Gricean inference is Gricean. BLS 16. 454-71.

_____. 1990b. Showdown at Truth-Value Gap: Burton-Roberts on presupposition. J. of Linguistics 26. 483-503.

_____. 1991. *Duplex negatio affirmat...:* The economy of double negation. To appear in CLS 27, Part 2: Papers from the parasession on negation.

Iwańska, Łucja. 1992. A general semantic model of negation in natural language: Representation and inference. U. of Illinois dissertation.

Jespersen, Otto. 1933. Essentials of English grammar. Reprinted, University, AL: U. of Alabama Press, 1964.

Kadmon, Nirit. 1987. On unique and non-unique reference and asymmetric quantification. U. of Massachusetts dissertation.

_____ 1990. Uniqueness. Linguistics & Philosophy 13. 273-324.

Karttunen, Lauri, and Stanley Peters. 1979. Conventional implicature. In Oh and Dinneen, 1-56.

Keenan, Edward L., and Jonathan Stavi. 1986. A semantic characterization of natural language determiners. Linguistics & Philosophy 9. 253-326.

Koenig, Jean-Pierre. 1990. Scalar predicates and negation. To appear in CLS 27, Part 2: Papers from the parasession on negation.

Kretzmann, Norman. 1968. William of Sherwood's treatise on syncategorematic words. Minneapolis: U. of Minnesota Press.

Krifka, Manfred. 1992. A framework for focus-sensitive quantification. In this volume.

Kuroda, S.-Y. 1969. Attachment transformations. Modern Studies in English, ed. by David A. Reibel and Sanford A. Schane, 331-51. Englewood Cliffs: Prentice-Hall.

Lakoff, George. 1970. Repartee. Foundations of Language 6. 389-422.

Lewis, David. 1979. Scorekeeping in a language game. J. Phil. Logic 8. 339-59.

Löbner, Sebastian. 1987. Quantification as a major module of natural language semantics. Studies in discourse representation theory and generalized quantifiers, ed by Jeroen Groenendijk, et al., 53- 85. Dordrecht: Reidel.

McCawley, James D. 1981. Everything that linguists have always wanted to know about logic but were ashamed to ask. Chicago: U. of Chicago Press.

_____. 1990. Contrastive negation and metalinguistic negation. To appear in CLS 27, Part 2: Papers from the parasession on negation.

Mill, John Stuart. 1867. An examination of Sir William Hamilton's philosophy, 3d ed. London: Longman.

Monck, W. H. S. 1881. Sir William Hamilton. London: Sampson, Low.

Morgan, Jerry. 1978. Two types of convention in indirect speech acts. Syntax and semantics 9: Pragmatics, ed. by Peter Cole, 261-80. New York: Academic Press.

Moser, Megan. 1992. The negation relation. U. of Pennsylvania dissertation.

Mullally, J. P. 1945. The summulae logicales of Peter of Spain. Notre Dame: U. of Notre Dame Press.

Nowell-Smith, P. H. 1954. Ethics. Harmondsworth: Pelican Books.

O'Hair, S.G. 1969. Implications and meaning. Theoria 35. 38-54.

Oh, Choon-Kyu Oh, and David A. Dinneen. 1979 (eds.). Syntax and semantics 11: Presupposition. New York: Academic Press.

Récanati, François. 1989. The pragmatics of what is said. Mind & Language 4. 295-329.

Rooth, Mats. .1985. Association with focus. U. of Massachusetts dissertation.

Rubinoff, Robert. 1987. Scalar implicature and the given/new distinction. Penn Review of Linguistics 11. 101-7.

Sadock, Jerrold. 1977. Truth and approximations. BLS 3. 430-39.

_____. 1984. Whither radical pragmatics? Georgetown University Round Table on Languages and Linguistics 1984, ed. by Deborah Schiffrin, 139-49. Washington: Georgetown U. Press.

Seuren, Pieter. 1988. Presupposition and negation. J. of Linguistics 6.175-226.

Sperber, Dan, and Deirdre Wilson. 1986. Relevance: Communication and cognition. Cambridge, MA: Harvard U. Press.

Spurgeon, Charles Haddon. 1882. The treasury of David, Volume 5. New York: Funk & Wagnalls.

Steele, Sir Richard. 1710. The Tatler, No. 178. Reprinted, Oxford: Clarendon Press, 1987, ed. by Donald F. Bond.

Stout, Rex 1955. Immune to murder. Reprinted in Three for the chair, 54-99. New York: Bantam Books, 1957.

Strawson, P.F. 1952. Introduction to logical theory. London: Methuen.

Sweetser, Eve. 1990. From etymology to pragmatics: Metaphorical and cultural aspects of semantic structure. Cambridge: Cambridge U. Press.

Taglicht, Josef. 1984. Message and emphasis: On focus and scope in English. London: Longman.

Vallduví, Enric. 1990. The informational component. U. of Penn. dissertation.

van der Sandt, Rob. 1991. Denial. To appear in CLS 27, Part 2: Papers from the parasession on negation.

Varga, László. 1980. Observations on negation in Hungarian and English. Acta Linguistica 30. 647-96.

Vaughan, Robert. 1860. Hours with the mystics, 3d edition, Vol. II. London: Strahan & Company.

von Fintel, Kai. To appear. Exceptive constructions. To appear in Natural Language Semantics.

Wainer, Jacques, and Anthony Maida. 1990. Good and bad news in formalizing generalized implicatures. BLS 16, 530-40.

Ward, Gregory, and Julia Hirschberg. 1991. A pragmatic analysis of tautological utterances. J. of Pragmatics 15. 507-20.

Wiche, Rob T. P. 1991. External and verb phrase negations in actual dialogues. J. of Semantics 8. 107-26.

Webster, Frank V. 1910. Comrades of the saddle, or The young rough riders of the plains. New York: Cupples & Leon.

Department of Linguistics
Yale University
1504A Yale Station
New Haven, CT 06520
LHORN@YALEVM.bitnet

Antecedent Contained Deletion in a Variable-Free Semantics[*]

Pauline Jacobson
Brown University

1. Background

The point of departure for this paper is the hypothesis that surface structures directly receive a model-theoretic interpretation rather than being mapped into some other level of representation like LF. In particular, this paper will focus on the phenomenon of Antecedent Contained Deletion (hereafter, ACD), because this phenomenon has often been taken to necessitate a level of LF (see e.g., Sag, 1976; Williams, 1977; Larson and May, 1990). After first reviewing the apparent problem which ACD poses for direct surface interpretation, I turn in Sec. 2 to a semantics which makes no essential use of variables. The basic idea of a variable-free semantics was proposed originally in Quine (1966), and its linguistic applications have been explored recently by, among others, Szabolcsi (1987, to appear), Hepple (1990), and Jacobson (1991b, 1992b). In Sec. 3 I argue that such an approach has considerable independent motivation - quite apart from the problem of ACD. In Sec. 4 I then return to ACD, to show that with a variable-free semantics it is trivial to account for this phenomenon under direct surface interpretation.

Within the literature on VP Deletion, we can distinguish two main approaches. The first - which we will refer to as the LF approach - claims that in an ordinary VP Deletion case like (1) the antecedent VP is first translated into some kind of LF (such as that shown in (2)) and this is then copied into the position of the "missing" VP following *will:*

(1) John will run, and Bill will too.

(2) John will $[_{VP}\ \lambda x[\text{run}'(x)]]$ and Bill will $[_{VP}\ e]$ too.

This general approach is proposed in Sag (1976) (although Sag phrased this in terms of deletion instead of copying), Williams (1977), Larson and May (1990), and others. The second proposal - call it the direct interpretation approach - claims that the *meaning* of the antecedent VP is directly supplied as the argument of the meaning of the auxiliary; this is proposed in, among others, Keenan (1971), Ladusaw (1979), Partee and Bach (1981), and Fodor and Sag (1982). Thus in (1) the property of running is salient in the discourse context, and so is picked up as the missing argument of the meaning of the auxiliary.

---

[*] I would like to thank Mary Dalrymple, David Dowty, Mark Hepple, Robert May, Barbara Partee, and Matthew Stone for helpful comments and discussion. This research was supported by NSF grant BNS-9014676.

Notice that under the direct interpretation approach, there is no particular reason why the missing property should have to be the meaning of some overt VP as opposed to any contextually salient property. In other words, it does not follow immediately from this approach that this should be a case of what Hankamer and Sag (1976) called *surface anaphora*. Space precludes a detailed discussion of this issue here; suffice it to note that a good deal of literature has indeed challenged the claim that this is truly surface anaphora. For a recent discussion of relevance, see Dalrymple, Shieber, and Pereira (1991).

But one of the biggest challenges to direct interpretation comes from ACD, as in (3):

(3) John will read every book which Bill (also) will.

According to traditional wisdom, the problem is roughly as follows. We need to find some salient property to be picked up by the meaning of *will*. But in (3) there is no way to find the relevant property. If we try to pick up the meaning of the matrix VP the result is an infinite regress, since no meaning is assigned to this VP until *will* finds its complement. The LF view, on the other hand, has no problem. Under this view the object NP is raised at LF, leaving a variable in the position following *read*. The LF for the matrix VP can then be copied into the position of the empty VP following *will*.

Nonetheless, Cormack (1985), Evans (1988), and Jacobson (1991a, 1992a) have all pointed out that given the general treatment of extraction in Categorial Grammar, this case of ACD is actually straightforward under direct interpretation. The fallacy in the line of reasoning above is that *will'* need not in fact find a VP-type meaning (i.e., a property) as its complement. Rather, it can function compose with some salient 2-place relation. In fact, this is exactly the type of meaning needed here, since *will* is within a relative clause. Put differently, the claim is that the meaning of (3) is put together in essentially the same way as is the meaning of a non-elliptical case like (4):

(4) John will read every book which Bill will (also) read.

In a Categorial account of extraction such as Steedman (1987) the meaning of *read* in (4) function composes with the meaning of *will*, and the meaning of *will-read* function composes with the type-lifted meaning of *Bill*. The result is that the expression *Bill will read* denotes a property, and is thus of the right type to serve as argument of the relative pronoun. But notice that the meaning of (3) can therefore be put together in essentially the same way. Here *will'* picks up some salient two-place relation - in this case *read'*- and it function composes with this; the rest of the composition works exactly as in the case of (4). The key here is that there is no need for an LF VP with a variable in object position precisely because this account of the semantics of relative clauses makes no use of a variable or a trace in object position in general. What this paper will show is that in a variable-free semantics, this basic idea can be extended to other cases. Moreover, Sag (1976) discussed some interesting interactions of scope and ACD. Space precludes a discussion of this here, but Cormack (1985) and Jacobson (1991a, 1992a) show that these interactions also follow equally well under the TVP ellipsis approach.

Note, then, that the claim here is that *Antecedent Contained* Deletion is somewhat of a misnomer - (3) is just a special case of the more general phenomenon of TVP ellipsis. In an antecedent containment case like (3) the "missing" TVP just happens to be within an NP which is the object of the antecedent TVP. But if this general kind of analysis is right, then this shouldn't be necessary - we should find other cases of TVP ellipsis, including those where the missing 2-place relation is picked up from a TVP in another sentence. And indeed, Evans (1988) noted that this expectation is borne out; TVP is possible in cases like (5)-(7) (where (5) and (6) are from Evans, 1988):

(5) I know which student Al likes, and I know which student Mary doesn't.
(6) Bagels, I like. Donuts, I don't.
(7) John was supposed to read several books this semester. But the only one that he actually did was *The Brothers Karamazov*.

Such sentences are especially interesting in that they challenge another argument for the LF view put forth in Sag (1976). Thus Sag further motivated the LF theory by claiming that there is a constraint to the effect that the variable in the "copied" VP must be bound by the same material as binds the variable in the antecedent VP. This constraint is designed to account for the ungrammaticality of cases like (8):

(8) *Which book will John read? I don't know - which book will Bill?

In (8), the LF for the first VP will be $read'(x)$ (or, $\lambda y[read'(x)(y)]$). If this is copied in to the empty position following *Bill* in the second sentence, then x in the second sentence will be bound by a different occurrence of *which book* as binds this in the antecedent VP; Sag's constraint thus rules this out. As discussed in detail in Partee and Bach (1981), such a constraint would be difficult to account for under a purely semantic approach since it relies on formal properties of LF; the reader is referred to their paper for a detailed exposition of the problem. Notice, though, that Sag's constraint will also incorrectly rule out all of the cases in (5)-(7) and thus the explanation for the impossibility of (8) must lie elsewhere. I have no account of this; Evans (1988) speculates that its ungrammaticality has to do with the presence of subject-aux inversion (thus contrast (8) with the grammatical (5)). To be sure, there are other cases in which TVP ellipsis is impossible which remain unexplained here; without additional context (9), for example, cannot have the meaning in (10):[1]

(9) Every man that Sue did kissed Mary.
(10) Every man that Sue kissed kissed Mary.

Thus while TVP ellipsis is certainly "fussier" than ordinary VP ellipsis, Sag's generalization appears to be incorrect. As we would expect under the analysis here, the "missing" 2-place relation can be supplied by the meaning of a TVP even in another sentence as in (6) and (7), and so the direct interpretation theory is quite viable.

Yet despite the fact that cases like (3) and (5)-(7) are quite naturally accounted for by the TVP ellipsis analysis, there remains one apparent problem for this account. As Cormack (1985) points out, it would appear that such an account will not extend to cases like (11) (discussed originally in Bouton, 1970):

(11) a. John kissed every woman who wanted him to.
b. John kissed every woman who thought he would.

The problem here is that there is no grammatical paraphrase in which we substitute in an overt transitive verb. If, for example, (11b) involves TVP ellipsis, then we would expect to be able to substitute in the ordinary transitive verb *kiss*. But doing this yields the completely ungrammatical sentence in (12); to get the grammatical paraphrase we need to substitute in a full VP, as in (13):

(12) *John kissed every woman who thought he would kiss.
(13) John kissed every woman who thought he would kiss her.

At first blush, then, it would appear that (11) cannot be an instance of TVP ellipsis, but is instead full VP ellipsis. But if this is the case, then we are back to the original problem. If the missing complement of *would* in (11b), for example, must be a property, then that property has to be made salient somehow. But it can't be derived from the meaning of the matrix VP, since this leads to an infinite regress. In other words, while the simple case of ACD in (3) is easily handled under direct interpretation, (11) appears not to be.

---

[1] Robert May has pointed out to me that another potential problem with the TVP ellipsis analysis is that it provides no explanation for the strangeness of (i), since *did'* should be able to pick up the meaning *said'*:

(i) ?*John said that Bill did that Sam left.

While I do not know why (i) is somewhat bad, two comments are in order. First, it is not clear to me that this is truly ungrammatical. Second, it is not clear how any thoery would account for the strangeness of (i), since in any case it should be possible as an instance of pseudo-gapping (Levin, 1979) as in (ii):

(ii) John said that Mary left, and Bill did that Sam left.

(I thank David Dowty for this point.) In fact, pseudo-gapping itself might also be subsumed under TVP ellipsis.

The remainder of this paper is devoted to showing that the problem of (11) is only apparent - under a completely variable-free semantics the analysis of (11) falls right out, and it too is an instance of TVP ellipsis. First, however, I will develop one implementation of a variable-free approach, and will then show that this has considerable independent motivation, quite apart from the problem of ACD; we return to (11) in Sec. 4.

2. A Variable-Free Semantics

Consider the three sentences in (14):

(14) a. Every man told every woman that [$_{S_2}$ Tom thinks [$_{S_3}$ Jo likes Sue]]
b. Every man$_i$ told every woman that [$_{S_2}$ Tom thinks [$_{S_3}$ he$_i$ likes Sue]]
c. Every man$_i$ told every woman$_j$ that [$_{S_2}$ Tom thinks [$_{S_3}$ he$_i$ likes her$_j$]]

The standard approach to variables does have a certain appeal. First, under this approach the most deeply embedded S in all three of these cases has the same kind of meaning: each of these denotes a function from assignment functions to propositions. This would appear to be a happy result, since constituents containing pronouns and corresponding constituents without pronouns have essentially the same syntactic distribution - we return to this point in Sec. 5. In a related vein, the standard approach allows for uniform combinatorics here - in all three cases in (14) the meaning of S_3 combines with the meaning of *thinks* in the same way.

But despite these advantages, there are also certain problems with the standard approach. The first concerns the status of variables as model-theoretic objects. If the meaning of, say, a sentence is a function from assignment functions to propositions then the assignment functions must themselves be model-theoretic objects, and this in turn means that the variables also are. While it is difficult to demonstrate that such a result is incorrect, it is surely not a particularly pleasant one. Moreover, under most theories making use of variables, each English pronoun must "come" with an index, which means that there are an infinite number of lexical items (*he$_1$*, *he$_2$*, etc.). This in itself may not be problematic, but what is suspicious is that each such lexical item makes exactly the same contribution to the meaning of a sentence. Both of these points are discussed in some detail in Landman and Moerdijk (1983).

Thus an alternative is a variable-free semantics of the sort first proposed in Quine (1966) and explored within the linguistic literature more recently in Szabolcsi (1987, to appear), Hepple (1990), Jacobson (1991b, 1992b), and others. (See also

Dowty (1992) for a comparison of approaches with and without variables, and for discussion of various variable-free approaches.) The idea here is that while S_3 in (14a) denotes a proposition, S_3 in (14b) denotes a function from individuals to propositions (i.e., a property). In (14c) S_3 denotes a 2-place relation.

There are a variety of ways that this basic program can be implemented; I will discuss just one here which is the one developed in Jacobson (1991b, 1992b). First, I will assume that there is a single pronoun *he* in English, and that its meaning denotes the identity function on individuals. (A similar account of the meaning of reflexives is developed in Pollard and Sag, 1982; since Pollard and Sag deal only with reflexives and I will deal here only with ordinary pronouns I will not attempt a detailed comparison of the two approaches.) Strictly speaking, the meaning of *he* is presumably the identity function on male individuals, and so such a pronoun does in fact make some contribution to the meaning of the larger constituent in which it occurs, but I will systematically ignore gender here. Second, we will allow for additional combinatorics besides just functional application. Take, for example, a case like (15):

(15) Every man$_i$ believes Mary likes him$_i$.

The meaning of *him* is the identity function, and so this will function compose with the meaning of *like* such that the VP *likes him* means simply *like'*. Further, I will assume that the meaning of this VP function composes with the type-lifted meaning of *Mary*, and so the meaning of the embedded S is the property: $\lambda x[like'(x)(m)]$. In cases involving two or more pronouns additional combinatorics will be needed, but I will not deal with these here (for a brief discussion of some such cases, see Jacobson, 1992b).

Before turning to the question of how it is that the pronoun is ultimately "bound", it should be noted that I will be assuming that free pronouns are just like bound ones. In other words, take a sentence with a free pronoun such as (16):

(16) Mary likes him.

We can assume that the meaning of this is composed in exactly the way discussed above; the consequence of this is that (16) denotes not a proposition but rather a property. Of course in order to extract information from such a sentence a listener needs to construct a proposition; it is reasonable to assume that this is generally done simply by applying this property to some contextually salient individual.

We can now turn to the question of just how the pronoun *him* in (15) is ultimately bound by *every man*. While there are again a variety of ways to effect binding, I will assume that the binding of this pronouns it he result of a type-shift operation on the verb *believes*. I will call this operation *z:* this operation is as follows:

(17) Let f be a function of type <X,<e,Y>>. Then *z*(f) is a function of type <<e,X>,<e,Y>>, where $z(f) = \lambda g[\lambda x[f(g(x))(x)]]$ (for g a variable of type <e,X>).
Let α_1 be an expression of syntactic category A with a meaning of type <X,<e,Y>>. Then there is a homophonous expression α_2 which is also of syntactic category A, where $\alpha_2' = z(\alpha_1')$.

((17) needs to be generalized for the case of 3-place verbs; see Jacobson (1992b).)

Consider, then, an ordinary transitive verb like *love*, which denotes the 2-place relation (between individuals) *love'*. This can shift by into a homophonous expression of the same syntactic category which denotes the relation *z(love')*, where *z(love')* is a relation between individuals and functions from individuals to individuals, such that x stands in the *z(love')* relation to a function f (of type <e,e>) just in case x stands in the *love'* relation to f(x). Similarly, *z(believe')* is a relation between individuals and properties such that x stands in the *z(believe')* relation to P just in case x stands in the *believe'* relation to P(x).

The variable-binding in (15) is now straightforward; *believe* here shifts by (17), and so its meaning is *z(believe')*. Recall that the embedded S in (15) denotes the property *λx[likes'(x)(m)]*. This can thus occur as argument of *z(believe')*, and so the VP *believe Mary likes him* will denote the property *λy[believe'(like'(y)(m))(y)]*; this is sketched in (18):

(18) $\text{believe-Mary-likes-him}' = z(\text{believe}')(\lambda x[\text{likes}'(x)(m)]) =$
$\lambda f[\lambda y[\text{believe}'(f(y))(y)]](\lambda x[\text{likes}'(x)(m)]) = \lambda y[\text{believe}'(\text{likes}'(y)(m))(y)]$

This property will then occur as argument of the subject NP.

3. Independent Motivation

3.1. Functional Questions

Before returning to ACD, we will briefly consider some independent motivation both for a variable-free semantics in general and for this particular implementation; Jacobson (1992b) provides additional motivation centering on paycheck pronouns, Bach-Peters sentences, and their interaction with weak crossover. The first piece of independent motivation to be considered here centers on functional questions such as (19) and (20) under the reading where *his mother* is an appropriate answer:

(19) Who does every Englishman love? His mother.
(20) Which of his relatives does every Englishman admire most? His mother.

Groenendijk and Stokhof (1983) and Engdahl (1986) analyze these in such a way that the gap has a complex meaning. Thus, they assume a semantics with variables, and translate the gap not as a simple variable over individuals but rather as a variable over functions of type <e,e> applied to a variable over individuals. The meaning of (19), then, can be represented roughly as in (21):

(21) what is the function f: every-Englishman'(λf[love'(f(x))(x)])
(for f a function of variable over functions of type <e,e>)

Note that this is rather informal; a more complete account of (19) depends on one's analysis of the semantics of questions in general which is orthogonal to the points here. For our purposes, it is sufficient to note that the G&S/Engdahl analysis assigns the meaning in (22) to the constituent *every Englishman love;* this meaning then presumably occurs as argument of the meaning of the question pronoun *who:*

(22) every-Englishman-love' = every-Englishman'(λf[love'(f(x))(x)])

I assume that the basic idea behind the G&S/Engdahl analysis is correct. Notice, however, that this particular implementation is incompatible with Categorial accounts of extraction which assume that a gap is simply a missing argument rather than corresponding to a trace or some other syntactic element which can be assigned a meaning. In other words, if a gap is nothing more than a missing argument, then it could not have the kind of complex meaning needed under this implementation. In view of this, I proposed in Jacobson (1991b, 1992c) that in (19) *love* type-shifts by the *z* operation. The meaning of (19) is thus put together in the way illustrated informally in (23); note that (23) is equivalent to (21):

(23) what is the function f: every-Englishman'(*z*(love')(f))

The semantic composition of the constituent *every Englishman love* is shown in more detail in (24); *love* shifts by *z* and then occurs as argument of the subject:

(24) every-Englishman' o *z*(love') = λf[every-Englishman'(*z*(love')(f))] =
λf[every-Englishman'(λx[love'(f(x))(x)])]

As in the G&S/Engdahl analysis, this then occurs as argument of the meaning of *who*.

The interesting thing about this approach to binding is that this allows us to treat the gap in a functional question just like any other gap. Here too it is simply a "missing" argument and - just like in an ordinary question - the meaning of the verb composes with the meaning of the subject. But once we have this type shift rule to account for functional questions, we have exactly the mechanism we need to do binding in general in a variable-free semantics. Incidentally, the existence of functional questions is one of the reasons why I do not adopt the approach to binding in Szabolcsi (to appear). In her implementation, the binding effect in a case like (15) is built into the meaning of the pronoun; the pronoun is, in essence, an argument reducer which is waiting to be bound. However, by building the binding effect into the meaning of the pronoun there is no obvious way to generalize this to functional questions.[2]

3.2. Answers to Functional Questions

A second argument for a variable-free semantics in general concerns the fact that *his mother* is a perfectly appropriate answer to a functional question like (19). Under the standard account of variables this is somewhat surprising. After all, under such an account *his mother* denotes - relative to some way to assign values to variables - simply an individual, and so it is hard to see why it should serve as the answer to a question which asks for the identity of a function from individuals to individuals. Note, though, that under the variable-free approach it follows immediately that this is an appropriate answer to this question. Since *his* is a pronoun it denotes only the identity function, and so its meaning function-composes with *mother'*; this means that *his mother* simply denotes the mother-function.[3] It thus follows that it is an appropriate answer to a functional question. (For related discussion, see Ginzburg, 1992.) Notice, incidentally, that this point goes through even if the particular mechanism for binding proposed here turns out to be wrong. Presumably *his mother* will denote the mother-function under almost any implementation of a variable-free semantics.

---

[2] Matthew Stone (personal communication) has pointed out to me that another way to effect binding in general is to build the binding into the meaning of the binder. Thus rather than having the operation z, one could have an operation mapping the ordinary generalized quantifier meaning of the NP *every man* into a second meaning: $\lambda R[\forall x(\text{man}'(x) \dashrightarrow R(x)(x))]$ (for R a variable of type <e,<e,t>>). Under this approach, the VP in (15) would denote a two-place relation which would occur as argument of the subject. Of course this, like the approach here, will need to be generalized to account for binders which are in object position, etc. I have not explored this approach in detail, but it would appear that it too would allow for an account of functional questions without having to assign a complex meaning to the gap.

[3] I am glossing over one complication which arises here due to the fact that *his* is a genitive. For simplicity, I am assuming that the lexical meaning of a relational noun like *mother'* is a function of type <e,<e,t>>. If it takes a PP object (as in *mother of Bill)* it then is an ordinary common noun of type <e,t>. Presumably, however, it can also type-shift into an expression wanting a genitive NP to give an NP; call this *mother*$_2$. I assume further that the meaning of *mother*$_2$ is $\lambda x[\iota y[\text{mother-of}'(x)(y)]]$ - this is thus the function mapping each individual into her/his unique mother (or what I have called above the mother-function). Thus in the case at hand *his* function-composes with the meaning of *mother*$_2$; since *his'* is only the identity function the result is again the function mapping each (male) individual into his unique mother.

3.3. Unexpected Binding in Copular Sentences

A similar point can be made on the basis of unexpected binding in copular sentences. By way of background, let us take the semantics proposed in Williams (1983) and Partee (1985) for an ordinary specificational copular sentence such as (25):

(25) The woman who John loves the most is Mary.

Under the Williams/Partee approach, the specificational reading for (25) is one in which the first NP is predicational and the second is referential. To formalize this notion, Partee suggests that an ordinary individual-denoting NP (such as *the woman who John loves the most*) can type-shift to denote the singleton set containing this individual. Thus on its predicational reading, the meaning of the first NP in (25) is: $\lambda x[x = \iota y[woman'(y) \;\&\; love\text{-}the\text{-}most'(y)(j)]]$. Moreover, *be* takes two arguments: one of type <X,t> and one of type X. In a predicational copular sentence, the argument of type <X,t> is in second position; in a specificational copular sentence (such as (25) under the reading of concern here) the argument of type <X,t> is in first position. The meaning of *be* is such that (25) simply applies the function denoted by the first NP to the individual *Mary'*; this is shown in (26):

(26) $(25') = \lambda x[x = \iota y[\text{woman}'(y) \;\&\; \text{love-the-most}'(y)(j)]](m) =$
$m = \iota y[\text{woman}'(y) \;\&\; \text{love-the-most}'(y)(j)]$

Now consider (27), discussed originally in Geach (1962) and more recently in Hornstein (1984) (a related case is also discussed in Groenendijk and Stokhof, 1983):

(27) The woman who every Englishman$_i$ loves the most is his$_i$ mother.

Under the Williams/Partee semantics combined with the approach to binding suggested here, (27) is straightforward provided we make one additional assumption. This is that ordinary NPs can, in certain cases, have functional readings. In particular, assume that an ordinary NP like *the woman who every Englishman loves* can denote the (unique) function f (of type <e,e>) whose range is women and which is such that every Englishman z(loves) f. More precisely, we will assume that functions of type <e,e> have "individual correlates" (in the sense of Chierchia, 1984) such that we can speak of the unique individual which is a function of this type. Thus in its functional reading, the meaning of an NP like *the* *woman who every Englishman loves* can be represented very roughly as (28) where $^{\wedge}$ is Chierchia's nominalization operator):[4]

(28) $\iota^{\wedge}f[\text{every-Englishman}'(z(\text{love}')(f)]$

Given this, (28) can type-shift into a predicative expression just as any other NP can under Partee's analysis, and so it will denote the function characterizing the singleton set containing this nominalized function. Since *his mother* denotes only the mother-function, the meaning for (27) is as represented in (29):

(29) $\lambda g[g = \iota^{\wedge}f[\text{every-Englishman}'(z(\text{love}')(f)]](^{\wedge}\text{mother}')$ (for g a variable over nominalized functions from individuals to individuals

(Informally, then, (27) simply says that the mother-function is the unique function f such that every Englishman z(loves) f.) Notice that this type of analysis eliminates the need for any kind of "reconstruction" (as proposed in Hornstein, 1984) whereby the post-copular constituent is put into the position of the gap in order for *every Englishman* to bind the pronoun.

3.4. Unexpected Inferences

The final argument that we consider here for a variable-free approach and for this implementation centers on a range of cases involving unexpected inferences. This phenomenon is exemplified in (30) (discussed in, among others, Higginbotham (to appear), Chierchia (1990), Reinhart (1990), and Pollard and Sag (to appear)):

(30) a. Every Englishman believes whatever every Frenchman believes.
b. Every Frenchman$_i$ believes that he$_i$ should drink red wine.
c. Therefore, every Englishman$_i$ believes that he$_i$ should drink red wine.

Under the standard view, *believe* takes a propositional complement, and so the complement in (30b) denotes an open proposition. Given this, (30c) does not follow from (30a) and (30b), but it is in fact a valid inference.

To account for this, Chierchia (1990) makes the following proposal. First, he takes it to be a lexical fact about *believe* that there are two verbs *believe* - one which I will for the moment call *believe*$_1$ and a second *believe*$_2$. *believe*$_1$ denotes a relation between individuals and propositions, while *believe*$_2$ denotes a relation between individuals and properties. Moreover, their meanings are related by a meaning postulate which ensures that if an individual x stands in the *believe*$_2$

---

[4] I ignore in (28) the fact that the range of the function must be the set of women. I also ignore the question of just how the meaning of this NP is put together so as to give this result.

relation to a property P then x stands in the *believe*$_1$ relation to P(x). The second part of Chierchia's proposal makes the standard assumption that the complement in (30b) translates as the open proposition *x should drink red wine*. However, he posits a special rule to map the open proposition into a property by λ-abstracting over x, so that this is mapped into the property *λx[x should drink red wine]*. We now have all the pieces to account for the inference here. All three sentences involve the verb *believe*$_2$. Thus the first sentence says that every Englishman stands in the *believe*$_2$ relation to whatever property every Frenchman stands in, and the second sentence says that every Frenchman stands in the *believe*$_2$ relation to the property of being an x who should drink red wine. From this (30c) follows.

But notice that these particular mechanics are all subsumed under the more general proposals here. First, Chierchia's *believe*$_2$*'* is simply *z(believe')* - the difference is that I am claiming that this is not a lexical property of *believe* per se, but rather that any expression can type-shift in this way to give the effect of binding. Second, in a variable-free approach we are spared from having to posit a special rule which maps an open proposition into a property. For here there is no such thing as an open proposition - since the embedded S in (30b) contains a pronoun it necessarily denotes a property. The idea, then, is that these inferences are an instance of exactly the same phenomenon that we find in functional questions. And more generally, this is all subsumed under the general mechanisms for bound pronouns.[5]

Chierchia did not hook this into a treatment of variables in general, since he sliced up the pie in a somewhat different fashion. Under his account, the unexpected inference here derives from a fact about *believe*. More specifically, he tries to motivate the existence of the two verbs *believe* by tying this in to the de re/ de se ambiguity found in sentences like (31) and discussed in, among others, Lewis (1979):

(31) John believes that his pants are on fire.

The de re reading is one where John may see himself with fiery pants in the mirror without realizing that it is indeed John who he is seeing; the de se reading is one where John believes that the fiery-pants property is self-ascribable. Thus Chierchia's idea is that what I have been calling *believe*$_1$ is de re *believe*, while *believe*$_2$ is de se *believe*. But Reinhart (1990) quite convincingly shows that the inference in (31) has nothing to do with de se belief. First, she points out that the ambiguity is preserved in such inference cases; I refer the reader to Reinhart's paper for a construction of the relevant cases.[6] Second, Reinhart points out that we get inferences of this type in a wide variety of cases having nothing to do with belief, as for example in (32):

---

[5] Note that the inference case here is another reason for preferring the type-shift operation *z* over an account of variable-binding such as that of Szabolcsi (to appear) in which the binding effect is built into the meaning of a pronoun. The problem with the latter approach concerns the semantics for (30a); since (30a) does not contain a pronoun in its complement it will simply mean that every Englishman believes whatever proposition every Frenchman believes, and so the inference will not go through. Under the approach here, on the other hand, the inference is valid because (30a) has a meaning whereby the free relative in object position can be taken to range over properties, and so (30a) can mean that every Englishman stands in the *z(believe')* relation to whatever property every Frenchman stands in.

(32) a. John will buy whatever Bill buys.
b. Bill_i bought his_i favorite car.
c. Therefore, John_i will buy his_i favorite car.

Notice that the inference in (32) follows from the general mechanics proposed here. Here we have *z(buy')* throughout, and the object NP in (32b) denotes a function from individuals to their favorite car. From this (32c) will be a valid inference from (32a) and (32b). Thus, while I have no analysis here of de se belief, we can conclude - with Reinhart - that it has nothing to do with the inference pattern in (30). Rather, the inferences in (30) and (32) all follow from the general mechanisms for binding in a variable-free semantics.

4. ACD Reconsidered

We are now in a position to return to the problematic ACD cases in (11):

(11) a. John kissed every woman who wanted him to.
b. John kissed every woman who thought he would.

Recall that the problem here was that the paraphrase in (12) with a simple TVP substituted in was ungrammatical and hence it appeared that this could not be a case of TVP ellipsis. Rather, the grammatical paraphrase needed a full VP, as in (13). But if it is a case of full VP ellipsis, then it would seem to involve antecedent containment, and so it was unclear how such a case could be analyzed under direct interpretation.

But of course under the variable-free approach, the VP *kiss her* in (13) means simply *kiss'*. This means that the semantic composition of (11b) can be just like that of (13), and so (11b) is indeed an instance of TVP ellipsis. To flesh this out, we can first consider how the meaning is put together for (13); this is sketched in (33). For expository ease I ignore here the fact that *he* in (13) is also a pronoun and will pretend that it's an ordinary name; I will thus assign it the type-lifted meaning $\lambda P[P(h)]$:[7]

---

[6] This fact was also pointed out to me by Sandro Zucchi.

[7] Cormack (1985) and Haik (1987) note that similar sentences with a full NP rather than a pronoun are quite marginal:

(i) ?*John kissed every woman who wanted Bill to.

(33) kiss-her' = kiss' o her' = kiss'
would-kiss-her' = would' o kiss' = λx[would'(kiss'(x))]
he-would-kiss-her' = λP[P(h)] o λx[would'(kiss'(x))] =
λx[would'(kiss'(x))(h)]
thought-he-would-kiss-her' = *z*(thought')(λx[would'(kiss'(x))(h)]) =
λx[thought'(would'(kiss'(x))(h))]
who' = λP[λQ[λy[Q(y) & P(y)]]]
who-thought-he-would-kiss-her' = who'(thought-he-would-kiss-her') =
λQ[λy[Q(y) & thought'(would'(kiss'(y))(h))]

In (11b) exactly the same thing happens; the only difference is that here the 2-place relation *kiss'* is grabbed up from the context. Thus (11b) is also an instance of TVP ellipsis, which means that these are unproblematic for direct interpretation.

If this kind of treatment is correct, then here too we would expect to get cases of this kind of TVP ellipsis where the missing TVP can be picked up from another sentence. In other words, here - as in the cases discussed in Sec. 1 - the TVP ellipsis analysis predicts that there is no real need for the "antecedent containment" phenomenon. And indeed this prediction is borne out, thus we get sentences like (34) through (36):

(34) I know which man wants Mary to kiss him, and I know which man wants her not to.
(35) John kissed Mary. But it was Sue who really wanted him to.
(36) John kissed several women. But none really wanted him to.

In (36), for example, the TVP-meaning *kiss'* is picked up from the previous sentence. Here *want* type-shifts such that it means *z(want')*, and so the subject *none* will bind the object slot of *kiss*.[8]

Notice that examples of this type also run counter to the claim in Sag (1976) discussed earlier (see also Hardt, this volume for discussion). Recall that Sag

---

(ii) ?*John kissed every woman who thought that Bill would.

I don't know why this is so, but it appears to have nothing to do with the fact that *he* (or *him*) in (11) can itself be a bound pronoun. Thus note that (35) and (36) below are fine, even though here *him* cannot be a bound pronoun. In fact, these seem to be alright as long as the subject of the clause containing the "missing" TVP is destressed; thus note that even the following is much better provided that *John* is not stressed:

(ii) John kissed Mary. But it was Sue who really wanted John to.

The explanation, then, would seem to lie in the interaction of stress with TVP ellipsis.

[8] Some of the examples in Hardt (this volume) are also of this type. Hardt's account of these is not exactly the same as mine, although I think that our basic claims are not incompatible.

claimed that an LF VP containing a variable in object position cannot be copied into a position where that variable will be bound by different material as binds the variable in the antecedent VP. Were we to recast the analysis of (34) - (36) in LF terms, this "rebinding" is exactly happens here. A similar case of TVP ellipsis which follows without difficulty under this approach is an example like (37) under the sloppy reading:

(37) Tom$_i$ wanted Sue to water his$_i$ plants, while John wanted Mary to.

Again, examples of this type were discussed by Sag (see also Partee and Bach, 1981) who claimed that they were ungrammatical. While I agree that Sag's particular cases are at least somewhat awkward under the sloppy reading, good cases of this general sort can easily be constructed, as witnessed by (37). This type of case is also handled readily under the account here. Note that under the variable-free account, the meaning of *water his plants* in the first clause is the 2-place relation $\lambda x[water'(plants\text{-}of'(x))]$. This composes with the (type-lifted) meaning of *Sue,* and *wanted* undergoes *z* ; this means that *Tom'* will ultimately "bind" the slot occupied by the pronoun. The meaning of the second clause is put together in essentially the same way, except that the 2-place relation $\lambda x[water'(plants\text{-}of'(x))]$ is picked up from the context.

There remains one question: why is it that the grammatical paraphrase for (11) is (13) and not (12)? In other words, why do we need a full syntactic VP here rather than a simple TVP? My claim is that this has nothing to do with the semantics, because a VP like *kiss her* means essentially the same thing as a TVP like *kiss*. Rather, this is a fact about English syntax. Except in extraction constructions, overt NPs are in general required in characteristic NP positions. Thus (12) is bad and (13) is good for the same reason that (38) is bad and (39) is good:

(38) *Every woman wanted him to kiss.
(39) Every woman$_i$ wanted him to kiss her$_i$.

The analysis here accounts for this because the type-shift rule in (17) changes the semantic type but not the syntactic category of an expression. Thus shifted *think* still wants a sentential complement syntactically, even though its meaning is *z(think')* which wants a property.

5. Further Issues: The Syntax/Semantics Mismatch

Of course, this is not the end of the story for what is not clear under the variable-free approach is why natural languages have pronouns at all. Pronouns do indeed make some contribution to the meaning - in English, for example, they supply gender information - but since their contribution is minimal one might expect to find gaps instead of pronouns.

I do not have the answer to this, but let me put the issue in a somewhat different way and conclude with some remarks about the syntax/semantics mismatch under this approach. As noted in Sec. 2, the most appealing aspect of the standard approach to variables is that it seems to avoid this mismatch. Consider, for example, the most deeply embedded Ss in (14a) and (14b). These certainly appear to be of the same syntactic category since - modulo the distribution of resumptive pronouns - sentences with pronouns have the same syntactic distribution as sentences without. The advantage of the standard approach, then, is that they also have the same syntactic type, while under the variable-free approach the embedded Ss in (14a) and (14b) have different types of meanings.

Yet such an objection to the variable-free approach can be turned on its head: it appears that an approach with variables in the semantics must also countenance this kind of syntax/semantics mismatch. The reason is that, as detailed by Partee (1992) (among others), there are many sorts of expressions which behave as if they contained some kind of variable but which do *not* contain any overt pronoun. Moreover, Partee notes that these expressions have much the same properties as do overt pronouns, and obey much the same constraints. A good example is (40):

(40) Every basketball fan$_i$ frequents the local$_i$ bar to watch the NCAA playoffs.

Here *local* can be bound by *every basketball fan*, just like an overt pronoun can. In the general program here the existence of such expressions is not surprising. We can analyze the meaning of *local* in such a way that the NP *the local bar* is a function from individuals to places. In (40) under the bound reading, *frequents* type-shifts by **z**.

What is especially noteworthy is the fact that these kinds of expressions seem to obey the same constraints on binding as do ordinary pronouns. Partee (1992) discusses this in some detail; to take a case not discussed by her consider the so-called "i-within-i" condition exemplified by the contrasts in (41):

(41) a. the woman$_i$ who married her$_i$ childhood friend
  b. the wife of John's childhood friend
  c. *the wife$_i$ of her$_i$ childhood friend

As shown by (41a), a pronoun within a relative clause can be bound by the subject of that relative clause. But (41c) shows that a pronoun within the complement of a relational known like *wife* cannot be bound within that NP. Thus the common noun *wife of John's childhood friend* can have the meaning represented in (42a), but *wife of her childhood friend* cannot have the meaning represented in (42b):

(42) a. $\text{wife-of}'(\text{childhood-friend-of}'(j))$
b. $\lambda x[\text{wife-of}'(\text{childhood-friend-of}'(x))(\boldsymbol{x})]$

Just why this is so is not entirely clear: if a relational noun like *wife* in the sentences above denotes a relation of type <e,<e,t>> then it should be able to undergo z in such a way that its last argument slot binds into its first argument. (Note that the i-within-i condition is equally mysterious under any other account of variable-binding; the problem here is not unique to the variable-free approach.) The important point, however, is that the same constraint holds with expressions like *local, nearby, across the street,* etc. This is shown by the contrasts in (43) and (44), which contrasts are strikingly robust:

(43) a. The man$_i$ who owns a local$_i$ / nearby$_i$ bar can get a drink anytime.
b. *The owner$_i$ of a local$_i$ / nearby$_i$ bar can get a drink anytime.
(44) a. Every man$_i$ who owns a bar across the street$_i$ can get a drink anytime.
b. *Every owner$_i$ of a bar across the street$_i$ can get a drink anytime.

In (44b), for example, *across the street* cannot be bound by the bar-owner, but only by someone else (most likely the speaker). It appears, then, that expressions with overt pronouns and functional expressions without overt pronouns pattern sufficiently alike that any theory should account for the binding of these by the same mechanisms. But if this conclusion is correct, then one of two things must be true. Either expressions which don't contain overt pronouns in the syntax always contain hidden pronouns or variables or - as I am suggesting here - overt pronouns function more or less like gaps. Either way, there is a mismatch between the semantics and the surface (or, visible) syntax. (Moreover, it is not entirely true that sentences with pronouns have exactly the same distribution as those with full NPs in the corresponding positions. The most obvious counterexample to this generalization concerns the distribution of sentences with resumptive pronouns. These can occur in relative clauses - where sentences with gaps are also allowed - but full NPs cannot (in general) be substituted in to the position of the resumptive pronoun.)

Finally, let us return to ACD, and consider one more question about the syntax. This question is: why is something like (3) actually good?

(3) John will read every book which Bill (also) will

The mystery here is that a relative pronoun like *which* usually requires syntactically a constituent with an NP gap. Indeed, in most non-movement accounts it subcategorizes for such a constituent. But here - although there is a missing VP - there is no NP gap. Again I don't have a full answer to this, but we can note that this problem is completely independent of the analysis here, and arises equally well under the LF view. In fact, something like (4) is especially problematic for a movement analysis of *wh* constructions, since there doesn't seem to be anywhere that *which* could have moved from. What a movement account would apparently have to do is to posit a structure empty VP following *will* where this VP contains a trace in object position bound by *which*. Thus the structure would have to be roughly as in (45):

(45) John will read [$_{NP}$ every book which Bill will [$_{VP}$ [$_{V}$ e] [$_{NP}$ t]]]

Interestingly enough, this ends up being a version of the TVP ellipsis analysis, since all that will need to be copied in is a TVP which will be copied into the empty V position.

But leaving aside the question of just what a movement analysis would say, I suspect that the solution is that a relative pronoun like *which* does not actually always require a constituent with an NP gap. After all, we also get cases with resumptive pronouns and no gaps. Even more relevant here, we can also get constituents without NP gaps in cases like the following:[9]

(46) I did everything that/which you told me.
(47) He ate everything that/which I had hoped.

There are, thus, a number of unresolved questions about the syntax of ACD, but many of these are quite independent of the analysis here. Nonetheless, it is clear that in a variable-free account, the semantics of ACD is quite straightforward. No LF is needed to account for this phenomenon, and thus this phenomenon is perfectly compatible with a theory with direct model-theoretic interpretation of surface structures. Since ACD has often been taken as one of the major stumbling blocks to such a theory, this would appear to give one more piece of evidence that such a view is tenable.

References

Bouton, Lawrence, 1970, "Antecedent-contained Pro-forms", *Papers from the 6th Regional Meeting, Chicago Linguistic Society*, Chicago: Chicago Linguistic Society, 154-165.

---

[9] Greg Carlson has pointed out to me that cases like this cannot all be analyzed as involving Null Complement Anaphora. This is demonstrated by (i): note that *hope* does not normally allow Null Complement Anaphora:

(i) *I hope to eat cake tonight, and Bill also hopes.

Notice that these also cannot be analyzed as containing ordinary NP gaps, since *hope* does not take an ordinary NP complement.

Chierchia, Gennaro, 1984, *Topics in the Syntax and Semantics of Infinitives and Gerunds*. Ph.D. Dissertation, University of Massachusetts. Distributed by GLSA, Linguistics Department, Amherst: University of Massachusetts.

Chierchia, Gennaro, 1990, "Anaphora and Attitudes Se Se", in R. Bartsch et al. (eds.), *Language in Action*, Dordrecht: Foris.

Cormack, Annabel, 1985, "VP Anaphora: Variables and Scope", in F. Landman and F. Veltman (eds.), *Varieties of Formal Semantics*, Dordrecht: Foris.

Dalrymple, Mary, Stuart Shieber, and Fernando Pereira, 1991, "Ellipsis and Higher Order Unification", *Linguistics and Philosophy* ***14***.

Dowty, David, 1992, "'Variable-Free' Syntax, Variable-Binding Syntax, The Natural Deduction Lambek Calculus, and the Crossover Constraint", in *Proceedings of the 11th Meeting of the West Coast Conference on Formal Semantics*, Stanford: CSLI Publications.

Engdahl, Elisabet, 1986, *Constituent Questions*. Dordrecht: D. Reidel Publishing Co.

Evans, Frederic, 1988, "Binding into Anaphoric Verb Phrases", in J. Powers and K. de Jong (eds.), *Proceedings of the 5th Annual Eastern States Conference on Linguistics*, 122-129.

Fodor, Janet and Ivan Sag, 1982, "Referential and Quantificational Indefinites", *Linguistics and Philosophy* ***5***, 355-398.

Geach, Peter, 1962. *Reference and Generality*. Ithaca: Cornell University Press.

Ginzburg, Jonathan, 1992. *Questions, queries, and facts: a semantics and pragmatics for interrogatives*. Ph.D. Dissertation, Stanford.

Groenendijk, Jeroen and Martin Stokhof, 1983, "Interrogative Quantifiers and Skolem Functions", in K. Ehlich and H. van Riemsdijk (eds.), *Connectedness in Sentence, Discourse and Text*. Tilburg Studies in Language and Literature 4, Tilburg University.

Haik, Isabelle, 1987, "Bound VPs that Need to Be", *Linguistics and Philosophy* ***18***.

Hankamer, Jorge and Ivan Sag, 1976, "Deep and Surface Anaphora", *Linguistic Inquiry* ***7***.

Hardt, Daniel, this volume, "A Semantic Theory of VP Ellipsis".

Hepple, Mark, 1990, *The Grammar and Processing of Order and Dependency: A Categorial Approach*. Ph.D. Dissertation, University of Edinburgh.

Higginbotham, James, 1992, "Reference and Control", in R. Larson et al. (eds.), *Control and Grammatical Theory*. Dordrecht: Kluwer.

Hornstein, Norbert, 1984, *Logic as Grammar*. Cambridge: MIT Press.

Jacobson, Pauline, 1991a, "Antecedent Contained Deletion without Logical Form", presented at the Annual Meeting of the Linguistic Society of America, Chicago.

Jacobson, Pauline, 1991b, "Paycheck Pronouns, Functional Questions, and Variable Binding", presented at the ASL/LSA Conference on Language and Logic, Santa Cruz.

Jacobson, Pauline, 1992a, "Flexible Categorial Grammars: Questions and Prospects" in R. Levine (ed.), *Formal Grammar: Theory and Implementation*, UBC Press.

Jacobson, Pauline, 1992b, "Bach-Peters Sentences in a Variable-Free Semantics", in *Proceedings of the 8th Amsterdam Colloquium*, Amsterdam: ITLI.

Jacobson, Pauline, 1992c, "Raising without Movement", in R. Larson et al. (eds.), *Control and Grammatical Theory*. Dordrecht: Kluwer.

Keenan, Edward, 1971, "Names, Quantifiers, and a Solution to the Sloppy Identity Problem", *Papers in Linguistics* **4**.

Ladusaw, William, 1979. *Polarity Sensitivity as Inherent Scope Relations*. Ph.D. Dissertation, University of Texas. Published by Garland Publishing, Inc., 1981.

Landman, Fred and Ieke Moerdijk, 1983, "Compositionality and the Analysis of Anaphora", *Linguistics and Philosophy* **6**, 89-114.

Larson, Richard and Robert May, 1990, "Antecedent Containment or Vacuous Movement: Reply to Baltin", *Linguistic Inquiry* **21**, 103-122.

Levin, Nancy, 1979. *Main Verb Ellipsis in Spoken English*. Ph.D. Dissertation, Ohio State University. Published in A. Zwicky (ed.), *Clitics and Ellipsis*, Ohio State Working Papers in Linguistics **24**, Columbus, 65-165.

Lewis, David, 1979, "Attitudes de-dicto and de-se", *The Philosophical Review* **88**.

Partee, Barbara, 1985, "Ambiguous Pseudo-Clefts with Unambiguous *Be*" in S. Berman, J-W. Choe, and J. McDonough (eds.), *Proceedings of NELS 16*, 354-367. Distributed by GLSA, Amherst: University of Massachusetts.

Partee, Barbara, 1992, "Anaphoric and Deictic Pieces of Meaning", in *Proceedings of the 8th Amsterdam Colloquium*. Amsterdam: ITLI.

Partee, Barbara and Emmon Bach, 1981, "Quantification, Pronouns, and VP Anaphora", in J. Groenendijk, T. Janssen, and M. Stokhof (eds.), *Formal Methods in the Study of Language: Proceedings of the Third Amsterdam Colloquium*. Amsterdam: Mathematisch Centrum.

Pollard, Cari and Ivan Sag, 1982, "Reflexives and Reciprocals in English: An Alternative to the binding Theory", in *Proceedings of the 2nd West Coast Conference on Formal Linguistics*, 189-203.

Pollard, Carl and Ivan Sag, to appear. *Head Driven Phrase Structure Grammar*. Chicago: University of Chicago Press and Stanford: CSLI Publications.

Quine, W.V., 1966, "Variables Explained Away", in *Selected Logic Papers*. New York: Random House, 227-235.

Reinhart, 1990, "Self Representation", presented at the Princeton Conference on Anaphora.

Sag, Ivan, 1976. *Deletion and Logical Form*. Ph.D. Dissertation, MIT. Published by Garland Publishing, Inc.

Steedman, Mark, 1987, "Combinatory Grammars and Parasitic Gaps", *Natural Language and Linguistic Theory* **5**b, 403-440.

Szabolcsi, Anna, 1987, "Bound Variables in Syntax: Are There Any?", in J. Groenendijk et al. (eds.), *Proceedings of the 6th Amsterdam Colloquium*. Amsterdam: ITLI.

Szabolcsi, Anna, to appear, "Combinatory Categorial Grammar and Projection from the Lexicon", in I. Sag and A. Szabolcsi (eds.), *Lexical Matters*. Stanford: CSLI Publications.

Williams, Edwin, 1977, "Discourse and Logical Form", *Linguistic Inquiry* **8**.

Williams, Edwin, 1983, "Semantic vs. Syntactic Categories", *Linguistics and Philosophy* **6**, 423-446.

Pauline Jacobson
Department of Cognitive and Linguistic Sciences
Box 1978
Brown University
Providence, RI 02912
LI700013@brownvm (bitnet)

A Framework for Focus-Sensitive Quantification

Manfred Krifka
University of Texas at Austin

1. Focus as a Source of Semantic Partition

Recent work on the semantics of natural language has shown that instances of quantification can be analyzed in terms of relations between two predicate meanings. That is, quantifications involve so-called TRIPARTITE STRUCTURES, consisting of a QUANTIFIER that identifies the relation, a RESTRICTOR as its first argument, and a MATRIX as its second argument. The prototypical case are quantificational NPs like (1), where the determiner, here *most*, is the quantifier, the noun, here *frogs*, is the restrictor, and the verbal predicate, here *croaked*, is the matrix:

(1) Most frogs croaked
$\mathrm{MOST}(\{x|\mathbf{frog}(x)\})(\{x|\mathbf{croak}(x)\})$, with $\mathrm{MOST} = \lambda X \lambda Y[\#(X \cap Y) > {}^{1}/_{2}\#(X)]$

Tripartite structures can also be identified with adverbial quantification:

(2) Mostly / Most of the time, if a frog is happy, it croaks
$\mathrm{MOST}(\{<s,x>|\mathbf{frog}(x)\ \&\ \mathbf{happy}(x,s)\})(\{<s,x>|\mathbf{croak}(x,s)\})$

We have to assume that (2) contains both a quantification over objects and over situations; this is implemented as a quantification over PAIRS of entities x and situations s. Quantifications over more than one entity are called quantification over CASES, following Lewis (1975). In the example at hand, the quantifier is an adverbial, the restrictor is supplied by the *if*-clause, and the matrix is given by the matrix clause.

Other cases of quantification, for example by verbal affixes, have been identified in the Amherst project on quantification (Bach, Kratzer, Partee 1989; Partee 1991). I should mention that the quantifier may be implicit, as in *If a frog is happy, it croaks*. In such cases, the inherent quantifier is the generic operator (cf. Krifka e.a., to appear), which can be interpreted as a quantifier with a modal component. In this article I will concentrate on non-generic cases in order to avoid additional complications involving quantification over possible worlds.

An obvious question at this point is how the mapping of semantic material of a quantificational expression to the restrictor and the matrix, respectively, is grammatically determined. This mapping, which has come to be called SEMANTIC PARTITION (cf. Diesing 1990), may depend on a range of different factors. For example, one obvious source is PHRASE STRUCTURE. In the case of quantificational NPs like *most frogs*, the nominal predicate, here *frogs*, forms the restrictor, and the matrix is determined by general scoping rules for quantified NPs -- in the simple case of (1), it is the VP. Another source for semantic partition are special SYNTACTIC OR MORPHOLOGICAL MARKERS, like the *if* of conditional sentences: it marks the clause that it c-commands as restrictor (cf. 2).

Another way to mark semantic partition is FOCUS, which is typically marked by sentence accent in languages like English, cf. Rooth (1985), also Newton (1979) and Schubert & Pelletier (1989) for generic sentences. In general, expressions that are in focus are mapped to the matrix. This effect shows up in the following minimal pair discussed by Rooth:

(3) a. [In St. Petersburg], OFFICERS_F always escorted ballerinas.
$\text{EVERY}(\{s|\exists x\exists y[\mathbf{escorted}(x,y,s)\ \&\ \mathbf{ballerina}(y)]\})$
$(\{s|\exists x\exists y[\mathbf{officer}(x)\ \&\ \mathbf{escorted}(x,y,s)\ \&\ \mathbf{ballerina}(y)]\})$
b. [In St. Petersburg], officers always escorted BALLERINAS_F.
$\text{EVERY}(\{s|\exists x\exists y[\mathbf{officer}(x)\ \&\ \mathbf{escorted}(x,y,s)]\})$
$(\{s|\exists x\exists y[\mathbf{officer}(x)\ \&\ \mathbf{escorted}(x,y,s)\ \&\ \mathbf{ballerina}(y)]\})$

In this article, I will concentrate on focus. See Krifka (1992) for a discussion of other sources of semantic partition, like article choice, case marking, word order, scrambling, and context).

2. Rooth's Treatment of Focus-Sensitive Quantification

In this section, I will discuss Rooth's theory of focus-sensitive quantification and some of its problems.

We assume that focus is represented by a feature F that applies to syntactic constituents and may be spelled out by sentence accent on certain syllables of certain words of the constituent in focus. The constituent in focus may be associated with a focusing operator such as *only* that c-commands its focus. Focus marking by sentence accent is often ambigous, as shown with the following example, where the main accent is on *Sue*:

(4) John only introduced Bill to SUE.

a. John only introduced Bill to $[\text{SUE}]_F$
"John introduced Bill to Sue and to no one else"
b. John only [introduced Bill to $\text{SUE}]_F$
"John introduced Bill to Sue and did nothing else"

In Rooth's theory, semantic representations consist of two parts, the usual meaning, and a set of alternatives (therefore we may call it ALTERNATIVE

SEMANTICS, following von Stechow 1989). The set of alternatives is generated by the expression(s) in focus.

For example, in the (a) reading of (4) the alternatives to the item in focus, *Sue*, is a set ALT(**s**). This set of alternatives generates alternative sets for more comprehensive expressions in a compositional way. The alternative set for (4.a) without the operator *only* then is the set of propositions given in (5.a). In a similar way, the alternative set for (4.b) without *only* can be derived as (5.b):

(5) a. *John introduced Bill to [SUE]*$_F$
Meaning: $\mathbf{introduce}(\mathbf{j},\mathbf{s},\mathbf{b})$.
Alternatives: $\{p|\exists x[x\in \mathrm{ALT}(\mathbf{s})\ \&\ p=\mathbf{introduced}(\mathbf{j},x,\mathbf{b})]\}$
b. *John [introduced Bill to SUE]*$_F$
Meaning: same as in (a)
Alternatives: $\{p|\exists P[P\in \mathrm{ALT}(\lambda x.\mathbf{introduced}(x,\mathbf{s},\mathbf{b}))\ \&\ p=P(\mathbf{j})]\}$

The operator ONLY simply states that the meaning itself is the only element in the set of alternatives that is true. (Actually, Rooth allows for focusing operators to be combined with VP-meanings. As in the preceding section, I will restrict the discussion here to focusing operators that take sentential scope; the generalization to other types is straightforward.)

(6) ONLY(M,A) iff $\mathbf{true}(M)\ \&\ \forall p[p\in A\ \&\ \mathbf{true}(p) \rightarrow p=M]$

Let us now turn to Rooth's treatment of focus-sensitive quantification. In Rooth (1985), he only treats cases that imply quantifications over situations (which he captures by quantifications over times, following Stump 1981). He assumes that episodic sentences are true of situations. Then the meaning of a sentence like (7.a) can be described as the set of situations in which Mary took John to the movies (.7b). Applied to a specific situation s_1, it is expressed that s_1 is a situation in which Mary took John to the movies (7.c).

(7) a. Mary took John to the movies.
b. $\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\}$
c. $s_1 \in \{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\}$

Focus on *John* will create the following representation:

8. Mary took [JOHN]$_F$ to the movies.
Meaning: As above, (b)
Alternatives: $\{S|\exists x[x\in \mathrm{ALT}(\mathbf{j})\ \&\ S=\{s|\mathbf{took}(\mathbf{m},x,s)\}]\}$

Focus-sensitive quantifiers relate the set of alternatives to the meaning. More precisely, they can be spelled out as quantifiers with the union of alternatives in the restrictor, and the meaning in the matrix. For example:

(9) *most of the time*, applied to meaning M and alternative set A:
$\mathrm{MOST}(\bigcup A)(M)$.

Let us look at one example:

(10) Most of the time, Mary took $[\mathrm{JOHN}]_F$ to the movies.
$\mathrm{MOST}(\bigcup\{S|\exists x[x\in \mathrm{ALT}(\mathbf{j})\,\&\, S=\{s|\mathbf{took}(\mathbf{m},x,s)\}]\})(\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\})$
$= \mathrm{MOST}(\{s|\exists x[x\in \mathrm{ALT}(\mathbf{j})\ \&\ \mathbf{took}(\mathbf{m},x,s)]\})(\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\})$

(10) can be paraphrased as: "In most situations in which Mary took an alternative to John to the movies, she took John to the movies". The context may provide a set of alternatives. If it does not, we can assume that the alternatives are the set of all suitable entities of the type of the expression in focus. For example, the alternatives of **j** will be the set of all individuals. In this case, the meaning of our example reduces to:

(11) $\mathrm{MOST}(\{s|\exists x.\mathbf{took}(\mathbf{m},x,s)\})(\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\})$

Rooth's reconstruction of adverbial quantification seems to be a good starting point. However, there are several problems with it.

One problem is that the generated readings often seem to be too liberal, which Rooth himself sees as a "possible point of dispute" (p. 173). There is an interpretation of (10) where this sentence is true if, and only if, in most cases in which Mary took someone to the movies she took John and no one else. The phenomenon is obviously related to the exhaustive interpretation we often find with sentences containing a focus.

One way to handle this problem is to treat exhaustivity by assuming pragmatic interpretation rules that can be spelled out by ONLY. In the case of sentences with the adverbial quantifier *most of the time*, we would like to get something like the following interpretation instead of (9):

(12) $\mathrm{MOST}(\bigcup A)(\mathrm{ONLY}(M,A))$

That is, most situations that are in the union of the alternatives are such that the meaning is the only one among the alternatives that holds for them. To get the types right, ONLY(M,A) must be interpreted as a set of situations. The definition that comes to mind is the following one:

(13) $\mathrm{ONLY}(M,A) = \{s|s\in M\ \&\ \forall S[S\in A\ \&\ s\in S \rightarrow S=M]\}$

That is, ONLY(M,A) holds for situations s that satisfy the meaning M, but no proper alternative to it. It seems that (13) is a straightforward reformulation of (6) in the new, situation-based framework. However, it does not capture the meaning of *only* or the exhaustive interpretation. This shows up in examples like the following one:

(14) Mary took JOHN to the movies.

$$\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\ \&$$
$$\forall S[\exists x[x \in \mathrm{ALT}(\mathbf{j})\ \&\ S=\{s|\mathbf{took}(\mathbf{m},x,s)\}] \rightarrow S=\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\}]\}$$
$$=\{s|\mathbf{took}(\mathbf{m},\mathbf{j},s)\&\forall s'[\exists x[x \in \mathrm{ALT}(\mathbf{j})\&\mathbf{took}(\mathbf{m},x,s')]\text{-}\mathbf{took}(\mathbf{m},\mathbf{j},s')]\}$$

This applies to situations s in which Mary took John to the movies, and for which it holds that for every situation s′ where Mary took some alternative to John to the movies, she took John to the movies. Now, the most natural interpretation of the conditions for s′ is that Mary can take more than one person to the movies at the same occasion, that is, it is possible that **took**(**m**,**j**,s′) and **took**(**m**,**b**,s′) for the same situation s′. But then (13), and consequently (12), cannot give us the required exhaustive interpretation. In order to arrive at a more adequate representation we would need to refer to the content of the item in focus and say that it is the only one among the alternatives that satisfies the proposition. But this is not possible in Rooth's framework, where we cannot refer to the meaning contribution of the focus directly.

Another problem is that we may have anaphoric bindings between the restrictor and the matrix:

(15) Most of the time, a frog that sees a fly tries to CATCH it.

$$\mathrm{MOST}(\{s|\exists x,y[\mathbf{frog}(x)\ \&\ \mathbf{fly}(y)\ \&\ \mathbf{see}(x,y,s)]\})$$
$$(\{s|\mathbf{try\text{-}to\text{-}catch}(x,y,s)\})$$

In the most straightforward representation given in (15), the variables x and y in the matrix remain unbound, hence the indicated formula is not an acceptable representation.

In particular, we find adverbial quantifications also in sentences that arguably have no situation argument to quantify over, as in the following example, which expresses a quantification over three-coloured cats instead of situations:

(16) Most of the time, a three-coloured cat is INFERTILE.

Obviously, examples like (15) and (16) are donkey sentences, and we should expect that a combination of focus representation with a framework like Discourse Representation, File Change Semantics or another dynamic semantic representation is called for.

3. The Structured Meaning Theory of Focus

I have suggested that one shortcoming of Alternative Semantics is that we cannot refer directly to the meaning contribution of an item in focus. There is another framework for the semantic representation of focus, Structured Meanings, developed by von Stechow and Jacobs, whose basic assumptions can be traced back to Jackendoff (1972, Ch. 6). In this framework, focus induces a partition into a BACKGROUND part and a FOCUS part, which is commonly represented by a pair of semantic representations <B,F>, where B can be applied to F, and B(F) is the standard interpretation. Focus operators take such focus-background structures as arguments. The examples (4.a,b) given above would be treated as follows:

(17) a. ONLY(<λx.**introduced**(**j**,x,**b**),**s**>)
b. ONLY(<λP.P(**j**), λx.**introduced**(x,**s**,**b**>)

Assuming the following meaning postulate for ONLY

(18) ONLY(<B,F>) :↔ B(F) & ∀X[X∈ ALT(F) & B(X) → X=F],
where X is a variable of the type of F
and ALT(F) is the set of alternatives to F.

we get the following representations:

(19) a. **introduced**(**j**,**s**,**b**) & ∀x[x∈ ALT(**s**) & **introduced**(**j**,x,**b**) → x=**s**]
b. **introduced**(**j**,**s**,**b**) & ∀P[P∈ ALT(λx.**introduced**(x,**s**,**b**)) & P(**j**) →
P=λx.**introduced**(x,**s**,**b**)]

The Structured Meaning framework can capture complex foci (20.a, by list representations) and multiple foci (20.b, by recursive focus-background structures).

(20) a. John only$_1$ introduced BILL$_{F1}$ to SUE$_{F1}$.
ONLY(<λx•y.**introduced**(**j**,x,y), **s**•**b**>)
b. Even$_1$ JOHN$_{F1}$ met only$_2$ SUE$_{F2}$
EVEN(<λx.ONLY(<λy.**met**(x,y), **s**>), **j**>)

Krifka (1992) has developed a framework in which examples of these types are analyzed in a compositional way. In this framework, the focus on a constituent with the semantic representation *A* introduces a focus-background structure with "empty" background, <λX.X, *A*>, where X is of the type of *A*. This focus-background structure is projected through semantic compositions. For example, if the original semantic composition rule called for application of *B* to *A*, then application of *B* to a structured meaning <λX.*C*,*D*> will yield <λX[*B*(*C*)],*D*>. If the original rule called for application of *A* to *B*, then application of the structured meaning $\langle\lambda X.C,D\rangle$ to B will yield $\langle\lambda X[C(B)],D\rangle$. Thus, information about the focus and the place in the background where it has to be interpreted is projected through semantic composition. Finally, focus-sensitive operators are applied to such background-focus structures.

The Structured Meaning framework provides us with a more articulate representation of expressions with focus than Alternative Semantics, insofar as we can access the meaning of an item in focus directly. In general, Alternative Semantics representations can be derived from Structured Meaning representations, but not vice versa. And it seems that we will need this additional information provided by Structured Meanings in order to cover the exhaustive interpretations discussed in the last section.

4. A Framework for Dynamic Interpretation

In this section, I will develop a framework for dynamic interpretation to capture anaphoric bindings in quantificational structures (cf. section 2). It will be related to Rooth (1987), mainly because I feel that its representations render the underlying ideas most perspicuously. The main differences to Rooth (1987) are that I will work with partial assignment functions (cf. Heim 1983), and that I will assume indices for possible worlds to capture modal quantifications and, in general, the increase of propositional information. Furthermore, I will use some abbreviatory conventions that hopefully improve the readability of the formulas.

Let us assume a countable infinite set of DISCOURSE REFERENTS (or INDICES) DR, for which I use natural numbers 1, 2, 3 etc. Let us call the domain of entities D, and let G be the set of ASSIGNMENT FUNCTIONS, that is, the set of partial functions from DR to D: $G = \bigcup\{G' \mid \exists X[X \subseteq DR \;\&\; G' = D^X]\}$. If g is an assignment function and d is an index in its domain, then I will write g_d instead of g(d). Two assignment functions g,k are said to be COMPATIBLE, $g \approx k$, iff they are identical for their shared domain: $g \approx k$ iff $\forall d[d \in DOM(g) \;\&\; d \in DOM(k) \rightarrow g_d = k_d]$. The AUGMENTATION of g with k, g+k, is defined as $g \cup k$, if $DOM(g) \cap DOM(k) = \phi$, and undefined otherwise.

I will use the following notations for VARIANTS of assignment functions; contrary to usual conventions, they will denote sets of assignment functions. First, g[d] should be the set of assignment functions that is like g with the addition that they map the index d to some entity in D, that is, $g[d] = \{k \mid \exists x[x \in D \;\&\; k = g+\{\langle d,x\rangle\}]\}$. Second, g[d/a] should be the set of assignment functions that are like g with the addition that they map the index d to the entity a, that is, $g[d/a] = \{k \mid k = g+\{\langle d,a\rangle\}\}$; note that this will be a singleton set. Be aware that these notations are defined only if $d \notin DOM(g)$. The two notations can be combined; for example, g[1/a,2,3/b] stands for $\{k \mid \exists x[x \in D \;\&\; k = g+\{\langle 1,a\rangle,\langle 2,x\rangle,\langle 3,b\rangle\}]\}$.

The interpretation of natural-language expressions will, in general, be with respect to an INPUT ASSIGNMENT, an OUTPUT ASSIGNMENT, and a

POSSIBLE WORLD. NPs are related to discourse referents; I assume that their syntactic indices are interpreted as semantic indices. Indefinite NPs bear indices that are new with respect to the input assignment, definite NPs have old indices, and quantificational NPs have new indices that are "active" only within the scope of quantification. Also, episodic verbs introduce discourse referents for situations; they are, in general, new.

For objects I will use variables x, y,..., for situations s, s′,..., for possible worlds w. I assume a relation **then** for situations; s-**then**-s′ means that the situation s is followed by the situation s′, and that both situations together form a larger, coherent situation. Worlds determine the meanings of constants; I assume that constants, in general, have a world argument, which will be written as a subscript. I use v as a meta-variable over vectors of individual terms of length ≥ 0. I use Q, Q′ etc. as variables for entities of type {<g,k,w,v>|...}, T, T′ etc. as a variable for entities of type λQ.{<g,k,w,v>|...}, and X,Y for variables of any type. For assignments I use variables g,h,k,i,j,f. Semantic combinations are typically by functional application. To save space, I will write tupels without commas; for example, instead of <g,k,w,y,k_2,s> I will write <gkwyk_2s>.

Indices of NPs are introduced by determiners, the functional heads of NPs. Indices of indefinite determiners are new, whereas indices of definite NPs and pronouns are old. NPs are of a type that maps tupels <gkwxv> to tupels <gkwv>, that is, they reduce the arguments of the verbal predicate, xv, by one to v. In general, I assume that the first available entity variable is bound, which implies that grammatical functions are encoded sequentially.

The situation variable of an episodic verb is bound by an operator that introduces a new index for that situation. This operator may be associated with the syntactic position of INFL as the functional head of a sentence, and therefore I will attach the corresponding syntactic index to the finite verb (cf. Kratzer 1989, who suggests that tense, a feature of INFL, specifies and binds the Davidsonian argument). INFL can be applied at different stages of the syntactic derivation. In particular, it might be applied as the last operator, or it might be applied before the subject. In this way, internal subjects and external subjects in the sense of Kratzer (1989) and Diesing (1990) can be modelled. Tense will be disregarded throughout.

The following example shows the treatment of indefinite NPs and sentences with transitive verbs. I will use capital letters in brackets, like [A], as abbreviation.

(21) A_1 frog saw_2 a_3 fly.

see, $\{\langle ggwyxs\rangle | \mathbf{see}_w(x,y,s)\}$, = [A]
|
| fly, $\{\langle ggwx\rangle | \mathbf{fly}(x)\}$, = [B]
| |
| | a_3, $\lambda Q'\lambda Q.\{\langle gkwv\rangle | \exists h\exists j[\langle ghwh_3\rangle \in Q' \ \&\ j \in h[1]\ \&\ \langle jkwh_3v\rangle \in Q]\}$, =[C]
| | /
| a_3 fly, [C]([B]), =
| $\lambda Q.\{\langle gkwv\rangle | \exists h[h \in g[3]\ \&\ \mathbf{fly}_w(h_3)\ \&\ \langle hkwh_3v\rangle \in Q]\}$, = [D]
| /
see a_3 fly, [D]([A]) = $\{\langle gkwxs\rangle | k \in g[3]\ \&\ \mathbf{fly}_w(k_3)\ \&\ \mathbf{see}_w(x,k_3,s)\}$, = [E]
|
| $INFL_2$, $\lambda Q.\{\langle gkwv\rangle | \exists h[h \in g[2]\ \&\ PAST(g_2)\ \&\ \langle hkwvh_2\rangle \in Q]\}$, = [F]
| /
saw_2 a_3 fly, [F]([E]), $\{\langle gkwx\rangle | k \in g[2,3]\ \&\ \mathbf{fly}_w(k_3)\ \&\ \mathbf{see}_w(x,k_3,k_2)\}$
|
| a_1 frog, $\lambda Q.\{\langle gkwv\rangle | \exists h[h \in g[1]\ \&\ \mathbf{frog}_w(h_1)\ \&\ \langle hkwh_1v\rangle \in Q]\}$
| /
a_1 frog saw_2 a fly_3,
  $\{\langle gkw\rangle | k \in g[1,2,3]\ \&\ \mathbf{frog}_w(k_1)\ \&\ \mathbf{fly}_w(k_3)\ \&\ \mathbf{see}_w(k_1,k_3,k_2)\}$, = [G]

The next example shows the treatment of anaphoric reference. As mentioned above, definite NPs and pronouns presuppose that their index is already in the domain of the input assignment. Similarly, the situation index of an episodic verb might indirectly refer to some situation index introduced before, insofar as its situation index is located after that previous index (see Partee 1984 for temporal anaphora in narrative discourses). I assume here that the INFL operator may have two indices, one referring to an antecedent situation index, and the other representing its own situation. Assuming that in the following sentence, which continues example (21), *it* refers to the frog, *the fly* refers to the fly, and INFL refers to a situation that follows the seeing situation, we get the following interpretation:

(22) It$_1$ caught$_{2,4}$ the$_3$ fly.

catch, $\{\langle gkwyxs\rangle | \mathbf{catch}_w(x,y,s)\}$
|
| the$_3$ fly, $\lambda Q.\{\langle gkwv\rangle | \mathbf{fly}_w(g_3) \;\&\; \langle gkwg_3v\rangle \in Q\}$
| /
catch the$_3$ fly, $\{\langle ggwxs\rangle | \mathbf{fly}_w(g_3) \;\&\; \mathbf{catch}_w(x,g_3,s)\}$
|
| INFL$_{2,4}$, $\lambda Q.\{\langle gkwv\rangle | \exists h[h\in g[4] \;\&\; g_1\text{-}\mathbf{then}\text{-}g_4 \;\&\; \langle hkwvh_4\rangle \in Q]\}$
| /
caught$_{2,4}$ the$_3$ fly,
| $\{\langle gkwx\rangle | k\in g[4] \;\&\; \mathbf{fly}_w(g_3) \;\&\; k_2\text{-}\mathbf{then}\text{-}k_4 \;\&\; \mathbf{catch}_w(x,k_3,k_4)\}$
|
| it$_1$, $\lambda Q.\{\langle gkwv\rangle | \langle gkwg_1v\rangle \in Q\}$
| /
it$_1$ caught$_{2,4}$ the$_3$ fly,
     $\{\langle gkw\rangle | k\in g[4] \;\&\; k_2\text{-}\mathbf{then}\text{-}k_4 \;\&\; \mathbf{fly}_w(k_3) \;\&\; \mathbf{catch}_w(k_1,k_3,k_4)\}$, = [H]

We can combine the first sentence with the second one by dynamic conjunction, for which I will use the semicolon.

(23)

A$_1$ frog saw$_2$ a$_3$ fly, [G]
|
| It$_1$ caught$_{2,4}$ the$_3$ fly, [H]
| /
A$_1$ frog saw$_2$ a$_3$ fly. It$_1$ caught$_4$ the$_2$ fly. [G];[H]
   $\{\langle gkw\rangle | \exists h[\langle ghw\rangle \in [G] \;\&\; \langle hkw\rangle \in [H]]\}$
   $= \{\langle gkw\rangle | k\in g[1,2,3,4] \;\&\; \mathbf{frog}_w(k_1) \;\&\; \mathbf{fly}_w(k_3) \;\&\; \mathbf{saw}_w(k_1,k_3,k_2)$
      $\&\; \mathbf{catch}_w(k_1,k_3,k_4) \;\&\; k_2\text{-}\mathbf{then}\text{-}k_4\}$

Quantified NPs do not introduce any anaphoric possibilities beyond their scope, that is, their input assigment and output assignment are the same. They are "tests", according to Groenendijk & Stokhof (1991). For example, the meaning of the determiner *most*$_d$ can be given as follows:

(24) *most*$_d$:
   $\lambda Q'\lambda Q.\{\langle ggwv\rangle | \mathrm{MOST}(\{x | \exists h,k[h\in g[d/x] \;\&\; \langle hkwx\rangle \in Q']\})$
      $(\{x | \exists h,k,j[h\in g[d/x] \;\&\; \langle hjwx\rangle \in Q' \;\&\; \langle jkwxv\rangle \in Q]\})\}$

See Chierchia (1990) for the main lines of this reconstruction of quantification with "built-in" conservativity. It represents the "weak" reading, as identified by

Rooth (1987), Kadmon (1987), and Schubert & Pelletier (1989). In terms of the standard example *Every farmer who owns a donkey beats it* we get a reading where it is sufficient that every farmer who owns a donkey beats at least one donkey that he owns. The STRONG INTERPRETATION -- that every farmer who owns a donkey must beat every donkey he owns -- can be generated with a slightly different scheme for quantifier meanings:

(25) $most_d$

$$\lambda Q'\lambda Q.\{\langle ggwv\rangle \mid \mathrm{MOST}(\{x \mid \exists h,k[h \in g[d/x] \;\&\; \langle hkwx\rangle \in Q']\})$$
$$(\{x \mid \forall h,j[h \in g[d/x] \;\&\; \langle hjwx\rangle \in Q' \rightarrow \exists k.\langle jkwxv\rangle \in Q]\})\}$$

So far, we have construed the dynamic meaning of discourses. The truth conditions for discourses are given by existential closure over the assignments and the world arguments with respect to the "actual" world: A text *A* is true with respect to the world w iff there are assignments g, k such that $\langle gkw\rangle \in A$. And *A* is true w.r.t. an input assignment g and a world w iff there is an output assignment k such that $\langle gkw\rangle \in A$.

5. Stuctured Meanings in the Dynamic Framework: The Case of "Only"

Let us now enrich the framework of the last section with structured meanings. This is fairly straightforward -- we might assume pairs of meanings <B,F>, where B and F are dynamic. However, we must reconsider the notion of alternatives to the focus meaning.

In a dynamic framework, the meaning of a focus constituent will naturally be dynamic. We indeed need dynamic foci, as they may exhibit anaphoric bindings:

(26) - Did John introduce every lady to her partner at left and her partner at right?
- John only introduced $every_1$ lady to $[her_{1,2}$ partner at LEFT$]_F$.

In the given context, the alternatives are anaphorically related to *every lady*. Furthermore, the choice of alternatives itself is dependent on the context in which the expression in focus is evaluated, as it will vary for different contemplated ladies. I will capture this dependency of the alternative sets to a focus F on an input assignment g by the notation $ALT_g(F)$.

Since the elements of alternative sets are dynamic, we must take care that they do not introduce their own binding possibilities and lead to an unwelcome inflation of alternative sets. For example, assume that that *Mary*$_1$ and *the*$_1$ *woman with a*$_2$ *hat* refer to the same person (but, of course, with different anaphoric potential). Obviously, we must exclude that the dynamic meaning of both NPs are in the same alternative set. In general, we want that all proper alternatives to a focus meaning refer, in the given input context, to an entity that is different from the entity to which the focus meaning refers, with respect to the input context.

The analysis for *only* that is closest to the non-dynamic counterpart (cf. 27) is the following (again, I assume for simplicity that *only* is a sentence operator):

(27) $\mathrm{ONLY}(\langle B,F\rangle) =$
$$\{\langle gkw\rangle \mid \langle gkw\rangle \in B(F)\ \&\ \forall X,h[X \in ALT_g(F)\ \&\ \langle ghw\rangle \in B(X) \rightarrow X=F]\}$$

The problem with this formulation, however, is that we take the alternatives with respect to the global input assignment g. What we would like to have is alternatives with respect to the local input assignment at which the focus is interpreted, as the discussion of sentences like (26) shows. A treatment of *only* that works with local alternative selection is the following,

(28) $\mathrm{ONLY}(\langle B,F\rangle) =$
(i) $B(F \cap \{\langle gkwv\rangle \mid \forall Q \forall k[Q \in ALT_g(F)\ \&\ \langle gkwv\rangle \in Q \rightarrow Q=F]\})$,
if F is of type $\{\langle gkwv\rangle \mid \ldots\}$
(ii) $B(F \cap \lambda Q.\{\langle gkwv\rangle \mid \forall T \forall k[T \in ALT_g(F)\ \&\ \langle gkwv\rangle \in T(Q) \rightarrow T=F]\})$,
if F is of type $\lambda Q.\{\langle gkwv\rangle \mid \ldots\}$.

in which the intersection of functional expressions is the type-lifted version of standard intersection: $A \cap B = \lambda X[A(X) \cap B(X)]$. For simplicity, I assume again that *only* is a sentential operator; the treatment as a VP operator is quite straightforward. (See Krifka (1992) for further discussion.)

6. Focus-Sensitive Quantification

Let us return to focus-sensitive adverbial quantification. As a meaning rule for *most of the time*, I would like to propose the following:

(29) $\mathrm{MOSTLY}(\langle B,F\rangle) =$
$$\{\langle ggw\rangle \mid \mathrm{MOST}(\{h \mid \exists f[f=g+h\ \&\ \langle gfw\rangle \in B(\{\langle ggwv\rangle \mid \exists Q \exists j[Q \in ALT_g(F)\ \&\ \langle gjwv\rangle \in Q]\})]\})(\{h \mid \exists i[i=g+h\ \&\ \langle giw\rangle \in \mathrm{ONLY}(\langle B,F\rangle)]\})\}$$
if F is of a type $\{\langle gkwv\rangle \mid \ldots\}$

That is, *most of the time* expresses a quantification over augmentations h of the input assignment g. As restrictor we take all the cases in which the input g and the output f, f=g+h, satisfy the background applied to some alternative of F, where the set of alternatives is again taken with respect to that input assignment at which the focus constituent is interpreted. We prevent the alternatives from introducing their own binding possibilities by binding the assignment j existentially -- in a sense, we skip over the indices introduced within the focus. As matrix we take the cases in which g and g+h satisfy the background applied to the focus directly, and in which the focus is the only item among the alternatives that yields the required result. Actually, we have to introduce an assignment i that is compatible with g+h, as the focus might introduce its own binding possibilities that are not captured yet by h.

The meaning rule in (29) gives the exhaustive interpretation. The non-exhaustive interpretation can be specified by changing the second argument of MOST to the somewhat simpler $\{h \mid \exists i[i=g+h \,\&\, \langle giw\rangle \in B(F)]\}$.

Let us look at some examples to see this meaning rule at work. I will compute the exhaustive interpretation.

(30) Most of the time, a_1 frog that $sees_2$ a_3 fly $[climbs_{2,4}$ a_5 $REED]_F$

a_1 frog that $sees_2$ a_3 fly, $\lambda Q.\{\langle gkwv\rangle \mid \exists h[h \in g[1,2,3] \,\&\, \mathbf{frog}_w(h_1) \,\&\, \mathbf{fly}_w(h_3) \,\&\, \mathbf{see}_w(h_1,h_3,h_2) \,\&\, \langle hkwh_1v\rangle \in Q]\}, = [I]$

climb a_5 reed, $\{\langle gkwxs\rangle \mid k \in g[5] \,\&\, \mathbf{reed}_w(k_5) \,\&\, \mathbf{climb}_w(x,k_5,s)\}, =[J]$

$[climb\ a_5\ REED]_F$, $\langle \lambda Q.Q, [J]\rangle$

$INFL_{2,4}$, $\lambda Q.\{\langle gkwv\rangle \mid \exists h[h \in g[4] \,\&\, g_1\text{-}\mathbf{then}\text{-}g_4 \,\&\, \langle hkwvh_4\rangle \in Q]\}, =[K]$

$[climbs_{2,4}\ a_5\ REED]_F$, $\langle [K],[J]\rangle$

a_1 frog that $sees_2$ a_3 fly $[climbs_{2,4}$ a_5 $REED]_F$, $\langle \lambda Q.[I]([K](Q)), [J]\rangle$

most of the time, $\lambda\langle B,F\rangle.MOSTLY(\langle B,F\rangle)$

most of the time, a_1 frog that $sees_2$ a_3 fly $[climbs_{2,4}$ a_5 $REED]_F$,

$$\{\langle ggw\rangle \mid MOST(\{h \mid \exists f[f=g+h \,\&\, \langle gfw\rangle \in [I]([K](\{\langle ggwxs\rangle \mid \exists Q \exists j[Q \in ALT_g([J]) \,\&\, \langle gjwxs\rangle \in Q]\}))]\})(\{h \mid \exists i[i=g+h \,\&\, \langle giw\rangle \in ONLY(\langle \lambda Q.[I]([K](Q)), [J]\rangle)]\})\}$$

Where the first argument of MOST reduces to:

$$\{h \mid \exists f[f=g+h \,\&\, f \in g[1,2,3,4] \,\&\, \mathbf{frog}_w(f_1) \,\&\, \mathbf{fly}_w(f_3) \,\&\, \mathbf{see}_w(f_1,f_3,f_2) \,\&\, f_2\text{-}\mathbf{then}\text{-}f_4 \,\&\, \exists Q \exists j[Q \in ALT_f([J]) \,\&\, \langle fjwf_1f_4\rangle \in Q]]\}$$

and the second argument of MOST reduces to:

$$\{h|\exists i[i=g+h \,\&\, \langle giw\rangle \in [I]([K]([J]\cap\{\langle gkwxs\rangle|\forall Q\forall k[Q\in ALT_g([J]) \,\&\, \\ \langle gkwxs\rangle\in Q \rightarrow Q=[J]]\}))]\}$$

$$= \{h|\exists i\exists j[i=g+h \,\&\, j\in g[1,2,3,4] \,\&\, \mathbf{frog}_w(j_1) \,\&\, \mathbf{fly}_w(j_3) \,\&\, \mathbf{see}_w(j_1,j_3,j_2) \,\&\, \\ j_2\text{-}\mathbf{then}\text{-}j_4 \,\&\, i\in j[5] \,\&\, \mathbf{reed}_w(i_5) \,\&\, \mathbf{climb}_w(j_1,i_5,j_4) \,\&\, \forall Q\forall k[Q\in ALT_j([J]) \\ \&\, \langle jkwj_1j_4\rangle\in Q \rightarrow Q=[J]]]\}$$

We get a dynamic meaning that accepts those input functions g, without changing them, and worlds w such that:
- most augmentations h of g such that f=g+h and f_1 is a frog, f_3 is a fly, f_1 sees f_3 in a situation f_2, and there is a situation f_4 occuring after f_2 such that f_1 does something that is an alternative to climbing a reed in f_4,
- are such that they can be extended to i, where i contains a j such that j_1 (=f_1) is a frog, j_3 (=f_3) is a fly, j_1 sees j_3 in j_2 (=f_2), j_4 (=f_4) is a situation following j_2, j_1 climbs a reed i_5 in j_4, and climbing a reed is the only thing j_1 does in j_4 among the alternatives, in the given context j.

In this formalization, then, one problem we found with the treatment in Rooth (1985) is solved: We can express quantifications over cases, not only quantifications over situations. Note that any bindings between elements in the background and elements in the focus are only expressed within the second argument of MOST.

What about the problem of exhaustivity? This is taken care of by the operator ONLY. To see how things work, let us have a look at the treatment of example (10). Here, the item in focus is a term, *John*, which is not of a type for which the meaning rule for *most of the time* was defined in (29). Terms are of a type represented by $\lambda Q.\{\langle gkw\rangle|...Q...\}$, where Q stands for the verbal predicate to which the term is applied. As in (48), we have to introduce in the restrictor some existentially bound assignment j that allows us to skip over the indices introduced by the item in focus. But in this case, we must make sure that we do not skip over the indices introduced by the verbal predicate for which Q stands for -- that is, we have to exempt indices that are introduced within Q. A meaning rule for *most of the time* that does that is the following one. The relevant part is the formula $\exists v[\langle gkwv\rangle\in Q]$, which guarantees that indices introduced within Q are not affected.

(31)
$$\begin{gathered}\{\langle ggw\rangle| \\ MOST(\{h|\exists f[f=g+h \,\&\, \langle gfw\rangle\in B(\lambda Q.\{\langle gkwv\rangle|\exists v[\langle gkwv\rangle\in Q] \,\&\, \\ \exists T\exists j[j=f \,\&\, T\in ALT_g(F) \,\&\, \langle gjwv\rangle\in T(Q)]\})]\}) \\ (\{h|\exists i[i=g+h \,\&\, \langle giw\rangle\in ONLY(\langle B,F\rangle)]\})\} \\ \text{if F is of a type } \lambda Q.\{\langle gkwv\rangle|...\}\end{gathered}$$

Let us now have a look at our example. I change it slightly to one that contains an indefinite NP in focus instead of a name, in order to show the point of the above definition. Imagine that little Mary has many stuffed animals, among them several teddy bears. She likes to take one of them to bed with her. Let us look at the following sentence in this context:

(32) Most of the time, Mary takes [a TEDDY bear]$_F$ to bed with her

a_3 teddy bear, $\lambda Q.\{\langle gkwv\rangle \mid \exists h[h\in g[3]\ \&\ \mathbf{teddy}_w(h_3)\ \&\ \langle hkwv\rangle\in Q]\}$, = [L]
|
[a_3 TEDDY bear], $\langle\lambda T.T, [L]\rangle$
|
| take to bed, $\{\langle ggwyxs\rangle \mid \mathbf{take}_w(x,y,s)\}$, = [M]
| /
take [a_3 TEDDY bear] to bed, $\langle\lambda T.T([M]), [L]\rangle$
|
| INFL$_2$, $\lambda Q.\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\ \langle hk\overrightarrow{w}h_2\rangle\in Q]\}$
| /
takes$_2$ [a_3 TEDDY bear] to bed,
| $\langle\lambda T.\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\ \langle hkwvh_2\rangle\in (T([M]))]\}, [L]\rangle$
|
| Mary$_1$, $\lambda Q.\{\langle gkwv\rangle\mid g_1=\mathbf{m}_w\ \&\ \langle gkwg_1v\rangle\in Q]\}$, = [N]
| /
Mary$_1$ takes$_2$ [a_3 TEDDY bear] to bed,
| $\langle\lambda T.[N](\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\ \langle hkwvh_2\rangle\in (T([M]))]\}), [L]\rangle$
|
| most of the time, $\lambda\langle B,F\rangle.\mathrm{MOSTLY}(\langle B,F\rangle)$
| /
most of the time, Mary$_1$ takes$_2$ [a_3 TEDDY bear] to bed,

$$\begin{aligned}
&\mathrm{MOSTLY}(\langle\lambda T.[N](\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\ \langle hkwvh_2\rangle\in (T([M]))]\}), [L]\rangle),\\
&= \{\langle ggw\rangle\mid\\
&\quad \mathrm{MOST}(\{h\mid\exists f[f=g+h\ \&\ \langle gfw\rangle\in [N](\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\\
&\qquad\quad \langle hkwvh_2\rangle\in (\{\langle gkwxs\rangle\mid\exists y'x's'[\langle gkwy'x's'\rangle\in [M]]\ \&\ \exists T\exists j[j=f\\
&\qquad\quad \&\ T\in \mathrm{ALT}_g([L])\ \&\ \langle gjwxs\rangle\in T([M])]\})]\})]\})\\
&\qquad (\{h\mid\exists i[i=g+h\ \&\ \langle giw\rangle\in \mathrm{ONLY}(\langle\lambda T.[N](\{\langle gkwv\rangle\mid\exists h[h\in g[2]\ \&\\
&\qquad\quad \langle hkwvh_2\rangle\in (T([M]))]\}), [L]\rangle)]\})\}
\end{aligned}$$

The first argument of MOST reduces to:

$$\begin{aligned}
&\{h\mid\exists f[f=g+h\ \&\ g_1=\mathbf{m}_w\ \&\ f\in g[2]\ \&\ \exists y,x,s[\mathbf{take}_w(x,y,s)]\ \&\ \exists T\exists j[j=f\ \&\\
&\quad T\in \mathrm{ALT}_g([L])\ \&\ \langle fjwg_1k_2\rangle\in T([M])]]]\}
\end{aligned}$$

The second argument of MOST reduces to:

$$\{h|\exists i[i \approx g+h \;\&\; g_1=\mathbf{m}_w \;\&\; \exists f[f \in g[2] \;\&\; i \in h[3] \;\&\; \mathbf{teddy}_w(i_3) \;\&\; \mathbf{take}_w(g_1,i_3,f_2) \;\&\; \forall T \forall j[T \in ALT_f([L]) \;\&\; <fjwg_1f_2> \in T([M]) \rightarrow T=[L]]]]\}$$

This accepts input assignments g, without changing them, and worlds w such that:
- most augmentations h of g with DOM(h) = {2} and f=g+h such that f_1 (=g_1) is Mary, f_2 is a situation where f_1 takes something to bed, and f_1 takes some alternative to a teddy bear to bed
- are such that they can be extended to i, where g_1 (= i_1) is Mary, i_3 is a teddy bear, g_1 takes i_3 to bed in situation i_2 (= f_2), and g_1 doesn't take any alternative to a teddy bear to bed in i_2. The alternatives here are with respect to an input assignment f that contains reference to the situation.

This gives us the right reading. We effectively quantify only over situations in which Mary takes something to bed with her, as the augmentations h just capture the situation variable. A simpler paraphrase would be: Most of the time when Mary took something to bed with her, she took a teddy bear and only a teddy bear with her. The crucial difference to the extension of Rooth's treatment developed in section (3) is that we do not express uniquess through the situation variable, but more directly by referring to the constituent in focus. In order to do so, we have to IDENTIFY THE CONTENT OF THE ITEM IN FOCUS. Hence, we make use of the additional information that Structured Meaning representations provide us, compared to Alternative Semantics.

7. Conditionals

In this section, I will discuss certain effects of focus in conditional sentences. In conditionals the antecedent clause should be part of the restrictor of a quantifier, and hence be part of the background. Now, this clause can have its own focus-background structure, which has an interesting effect on quantification. Kadmon (1987) observed that different accents within the antecedent clause lead to different types of asymmetric quantification: It seems that the quantification is not over all the indices provided by the antecedent clause (cf. also Kratzer 1989, Heim 1990). If we paraphrase *usually* by *most*, then we get contrasts like the following one:

(33) a. If a painter lives in a VILLAGE, it is usually nice.
"Most painters that live in a village live in a nice one"

b. If a PAINTER lives in a village, it is usually nice.
"Most villages in which there lives a painter are nice"

Recently two theories have been put forward to explain these differences, namely Kratzer (1989) and Chierchia (1990); see also de Swart (1991) for a comparison of those theories. According to Kratzer, we have existential closure over the VP of the *if*-clause, which prevents the indices of NPs within the VP to be quantified over. This principle must be supplemented by assumptions that the subject can be interpreted VP-internally, and that constituents that are orginally VP-internal may be scrambled outside of the VP, thus escaping existential closure. In Krifka (1992), I discuss some of the problems of this approach. According to Chierchia (1990), quantification is only over topical constituents, which typically are unaccented. One problem with this explanation is that in languages that have an explicit topic marker, like Japanese or Korean, NPs marked as topics do not occur within antecedent clauses.

I think that what matters is not topicality, but being part of the background of a background-focus structure. The right generalization seems to be that indices introduced by expressions in the BACKGROUND of a conditional clause are BOUND BY THE QUANTIFIER, whereas the indices introduced by expressions in the FOCUS are subjected to existential closure and thus are PREVENTED FROM BEING QUANTIFIED OVER. Given that analysis, we would get the right readings if, in (33.a), *a painter* is in the background, and in (33.b), *a village* is in the background. Actually, (33.b) would have at least two different interpretations: either the meaning of *a village* is the only item in the restrictor, or both *lives* and *a village* are in the restrictor.

We can express the influence of focus-background articulation in conditional clauses with the following meaning rule:

(34) $\mathrm{MOSTLY}(\textit{if} \langle B,F\rangle \textit{ then } C)$:

$$\{\langle ggw\rangle | \mathrm{MOST}(\{h|\exists f[f=g+h \ \&\ \langle gfw\rangle \in B(\{\langle ggwv\rangle|\exists j[\langle gjwv\rangle \in F]\})]\})$$
$$(\{h|\exists k[k=g+h \ \&\ \langle gkw\rangle \in [B(F);C]]\})\},$$

if F is of a type $\{\langle gkwv\rangle|...\}$.

That is, MOSTLY(*if* <B,F> *then* C) is true of input assignments g and worlds w iff most ways h to augment g such that the input g, the output g+h and the world w satisfy the background applied to the focus (where indices introduced within the focus are existentially bound) are such that g+h can be extended to k such that the input g, the output k and the world w satisfy the background applied to the focus, composed with the consequent C. The essential part of this meaning rule is that indices that are introduced within the focus are existentially bound with narrow scope in the semantic representation of the antecendent, hence they are not accessible to the main quantifier. Let us discuss an example:

(35) Most of the time, if a_1 frog [sees$_2$ a_3 FLY]$_F$, it_1 catches$_{2,4}$ it_3.

[see a_3 FLY]$_F$, $\langle \lambda Q.Q, \{\langle gkwxs\rangle | k\in g[3] \,\&\, \mathbf{see}_w(x,k_3,s) \,\&\, \mathbf{fly}_w(k_3)\}\rangle$,
| $= \langle \lambda Q.Q, [O]\rangle$
|
| INFL$_2$, $\lambda Q.\{\langle gkwv\rangle | \exists h[h\in g[2] \,\&\, \langle hkwvh_2\rangle\in Q]\}$,
| /
[sees$_2$ a_3 FLY]$_F$, $\langle \lambda Q.\{\langle gkwv\rangle | \exists h[h\in g[2] \,\&\, \langle hkwvh_2\rangle\in Q]\}, [O]\rangle$
|
| a_1 frog, $\lambda Q.\{\langle gkwv\rangle | \exists h[h\in g[1] \,\&\, \mathbf{frog}_w(h_1) \,\&\, \langle hkwh_1v\rangle\in Q]\}$
| /
a_1 frog [sees$_2$ a_3 FLY]$_F$, $\langle \lambda Q.\{\langle gkwv\rangle | \exists h[h\in g[1,2] \,\&\, \mathbf{frog}_w(h_1)$
| $\&\, \langle hkwh_1vh_2\rangle\in Q]\}, [O]\rangle, = \langle [P],[O]\rangle$
|
| it_1 catches$_{2,4}$ it_3,
| $\{\langle gkw\rangle | k\in g[4] \,\&\, k_2\text{-}\mathbf{then}\text{-}k_4 \,\&\, \mathbf{catch}_w(k_1,k_3,k_4)\}, = [Q]$
| |
| most of the time
| /
most of the time, if a_1 frog [sees$_2$ a_3 FLY]$_F$, it_1 catches$_{2,4}$ it_3

$$\{\langle ggw\rangle | \mathrm{MOST}(\{h | \exists f[f=g+h \,\&\, \langle gfw\rangle\in [P]([O])\}) (\{h | \exists k[k=g+h \,\&\, \langle gkw\rangle\in [[P]([O]);[Q]]]\})\}$$

$$= \{\langle ggw\rangle | \mathrm{MOST}(\{h | \exists f[f=g+h \,\&\, f\in g[1,2] \,\&\, \mathbf{frog}_w(f_1) \,\&\, \exists j[j\in f[3] \,\&\, \mathbf{see}_w(f_1,j_3,f_2) \,\&\, \mathbf{fly}_w(j_3)]]\}) (\{h | \exists k[k=g+h \,\&\, k\in g[1,2,3,4] \,\&\, \mathbf{frog}_w(k_1) \,\&\, \mathbf{fly}_w(k_3) \,\&\, \mathbf{see}_w(k_1,k_3,k_2) \,\&\, k_2\text{-}\mathbf{then}\text{-}k_4 \,\&\, \mathbf{catch}(k_1,k_3,k_4)]\})\}$$

This accepts input assignments g, without changing them, and worlds w such that most extensions h of g, where the domain of h is {1,2} and h_1 is a frog that can be extended to j, where j_3 is a fly and h_2 is a seeing of j_3 by h_1, are such that they can be extended to k, where k_1 (=h_1) is a frog, k_3 is a fly, k_2 (= h_2) is a seeing of k_3 by k_2, and k_4 is a situation following k_2 in which k_1 catches k_3. This gives us the intuitively correct interpretation of the most prominent reading: we quantify over frogs h_1 and situations h_2 in which h_1 sees a fly.

The semantic rule (34) is restricted to foci of non-functional types. How can we extend it to cover cases where, e.g., an NP is in focus, that is, an expression of a type $\lambda Q.\{\langle gkwv\rangle | \ldots\}$? The extension is relatively straightforward. However, we have to make sure that indices that are introduced within Q are accessible for the quantifier, that is, we have to exempt them from existential quantification. This is done by the following meaning rule:

(36) $$\begin{aligned}&\{\langle ggw\rangle|\mathrm{MOST}(\{h|\exists f[f=g+h \;\&\; \langle gfw\rangle\in B(\lambda Q.\{\langle gkw\rangle|\exists v[\langle gkwv\rangle\in Q] \;\&\\ &\qquad\qquad \exists j[j\approx k \;\&\; \langle gjw\rangle\in F(Q)]\})]\})\\ &\qquad\qquad (\{h|\exists k[k\approx g+h \;\&\; \langle gkw\rangle\in[B(F);C]]\})\},\\ &\text{if } F \text{ is of a type } \lambda Q.\{\langle gkwv\rangle|..Q..\}\end{aligned}$$

See Krifka (1992) for further examples and for a discussion of some observations by Kratzer (1989) and de Swart (1991) that quantificational adverbials need a variable to quantify over.

8. Final Remarks

In this paper, I tried to give a formal account of the influence of focus on quantification, in particular on the semantic partition into restrictor and matrix. This was carried out in a framework that combined the Structured Meaning representation of focus with a version of Dynamic Semantics to capture anaphoric bindings. In developing it, we had to pay attention to the notion of focus alternatives within a dynamic setting.

There are several areas that need elaboration. One is that I assumed that focus-sensitive operators apply to sentences. This is not true in general: Particles like *only* and quantifiers like *always* clearly can be VP operators. It is relatively straightforward to generalize the semantic types of these operators such that they can be applied to VP meanings of the type {<gkwx>|...}.

One point which I have suppressed in this paper is that focus can have different sources -- it might be focus associated with an overt operator, or it might be focus associated with the illocutionary operator, so-called "free" focus. We can assume that it is always the focus associated to the highest operator that is spelled out by sentence accent (cf. Jacobs 1991, Krifka 1991). This can easily lead to confusion. In the following example, focus on *SUE* does not indicate that this phrase is interpreted in the matrix; *John* is interpreted in the matrix, as focus on *SUE* is licensed by the illocutionary operator.

(37) [Did Mary always take JOHN to the movies?]
No, SUE always took John to the movies.

Finally, we might question whether the restrictor of an adverbial quantifier is always given by focus-background structures (if not provided by the context). There is an interesting case involving relative clauses which Anna Szabolcsi brought to my attention with examples like (38.a):

(38) a. We should thank the man whom Mary always took to the movies.
b. We should thank the man whom Mary only took to the movies.

(38.a) can be interpreted as: "We should thank the man such that, if Mary took someone to the movies, it was him". But note that the representative of *the man* within the relative clause, *whom* (or the empty element coindexed with *whom*) is not stressed. We might say that relative pronouns, let alone empty elements, cannot bear stress, but still may be in focus. However, if this is so, then *only* in (38.b) should be associable with the object NP, yielding the reading "We should thank the man such that Mary took only HIM to the movies", which is not available. Szabolcsi suggests that the creation of an empty element by WH-movement is crucial for the construction of the restrictor, which in our example yields the semantic representation $\lambda x \exists s[\mathbf{took}(\mathbf{m},x,s)]$. Szabolcsi (1985), who discusses the focus-sensitivity of superlatives, takes the creation of empty elements as the crucial property even in the cases with focus, following the focus theory of Chomsky (1977), according to which focus implies Wh-movement. However, assuming movement is problematic, as it would not abide by syntactic island constraints (cf. Jackendoff 1972, Krifka 1991).

There is another type of case where we might question how predictive focus is in determining semantic partition of adverbial quantifiers. Schubert & Pelletier (1989), in their discussion of "reference ensembles" (roughly, restrictors), give a number of examples for which they do not claim that focus plays a role. One of their examples is

(39) Cats usually land on their feet.

Note that we could explain this example in terms of background-focus structure: The main accent probably is on *feet*, hence we have *Cats usually land [on their FEET]*$_F$ as a plausible analysis, which would generate the reading: Usually, when cats land on something (a body part of them), then they land on their feet. However, it seems that (39) has a very similar interpretation with the whole VP *land on their feet* in focus. In this case, Schubert & Pelletier's suggestion that PRESUPPOSITIONS may furnish the reference ensembles (i.e., the restrictor of the quantification) seems to be on the right track, as every case of landing on one's feet presupposes that one is coming down in the first place.

I don't see Schubert & Pelletier's presuppositional theory and the focus theory proposed here as necessarily being in conflict with each other. It seems plausible to assume that the background of a focus-background structure provides or identifies the presuppositions of an expression. If this is so, the role of focus-background structures in semantic partitions could ultimately be subsumed under a general theory of the role of presupposition in quantification.

References

Bach, E., Kratzer, A., Partee, B. (1989). *Papers on Quantification.* Dept. of Linguistics, University of Massachusetts at Amherst.

Chierchia, G. (1990). Anaphora and Dynamic Logic. Amsterdam: ITLI Prepublication Series, LP-90-07

Chomsky, N. (1977). On WH movement. In Culicover, Wasow, Akmajian (ed.), *Formal Syntax.* New York: Academic Press.

Diesing, M. (1990). The Syntactic Roots of Semantic Partition. Ph.D. Dissertation, University of Massachusetts at Amherst.

Groenendijk, J., & Stokhof, M. (1991). Dynamic Predicate Logic. *Linguistics and Philosophy*, 14

Heim, I. (1983). File Change Semantics and the Familiarity Theory of Definiteness. In R. Bäuerle e.a. (eds.), *Meaning, Use and the Interpretation of Language.* Berlin, De Gruyter.

Jackendoff, R. (1972). Semantic Interpretation in Generative Grammar. Cambridge, Mass.: MIT Press.

Jacobs, J. (1991). Focus Ambiguities. Journal of Semantics, 8.

Kadmon, N. (1987). On Unique and Non-Unique Reference and Asymmetric Quantification. Ph.D. Diss., Univ. Mass. at Amherst.

Kratzer, A. (1989). Stage-Level and Individual-Level Predicates. In E. Bach, A. Kratzer, & B. Partee (ed.), Papers on Quantification

Krifka, M. (1991). A Compositional Semantics for Multiple Focus Constructions. *Proceedings of Semantics and Linguistic Theory (SALT) I*, Cornell Working Papers 11, 1991.

Krifka, M. (1992). Focus, Quantification, and Dynamic Interpretation. To appear in the proceedings of the 8th Amsterdam Colloquium, Berlin, Foris - de Gruyter.

Krifka, M. e.a. (to appear): Genericity. An Introduction. In G. Carlson & F.J. Pelletier (ed.), *The Generic Book.* Chicago University Press.

Lewis, D. (1975). Adverbs of Quantification. In Formal Semantics of Natural Languages. (pp. 3-5). Cambridge University Press.

Newton, B. (1979). Scenarios, Modality, and Verbal Aspect in Modern Greek. *Language* 55.

Partee, B. (1984). Nominal and Temporal Anaphora. *Linguistics & Philosophy* 7.

Partee, B. (1991). Topic, Focus and Quantification. In *Proceedings from Semantics and Linguistic Theory I*, Cornell Working Papers in Linguistics 10.

Rooth, M. (1985). Association with Focus. Ph.D.-Dissertation, University of Massachusetts at Amherst.

Rooth, M. (1987). Noun Phrase Interpretation in Montague Grammar, File Change Semantics, and Situation Semantics. In P. Gärdenfors (ed.), Generalized Quantifiers. Linguistic and Logical Approaches. Dordrecht: Reidel.

Schubert, L. & F. J. Pelletier (1989): Generically Speaking, or Using Discourse Interpretation Theory to Interprete Generics. In G. Chierchia, B. Partee, R. Turner (eds.), *Properties, Types and Meaning*. Reidel.

Stechow, A. von (1989). Focusing and backgrounding operators. Universität Konstanz, Fachgruppe Sprachwissenschaft, Arbeitspapier Nr. 6. Konstanz.

Stump, G. (1981). The Interpretation of Frequency Adverbs. Linguistics and Philosophy, 4.

Swart, Henriëtte de (1991). Adverbs of Quantification: A Generalized Quantifier Approach. Doctoral Dissertation, Rijksuniversiteit Groningen.

Szabolcsi, A. (1986). Comparative Superlatives. *MIT Working Papers in Theoretical Linguistics* 8.

Expressing Negation

William A. Ladusaw
University of California, Santa Cruz

Introduction[*]

My focus in this paper is the syntax-semantics interface for the interpretation of negation in languages which show negative concord, as illustrated in the sentences in (1)-(4).

(1) *Nobody* said *nothing* to *nobody*. [NS English]
'Nobody said anything to anyone.'

(2) Maria *didn't* say *nothing* to *nobody*. [NS English]
'Maria didn't say anything to anyone.'

(3) Mario *non* ha parlato di *niente* con *nessuno*. [Italian]
'Mario hasn't spoken with anyone about anything.'

(4) *No* m'ha telefonat *ningú*. [Catalan]
'Nobody has telephoned me.'

Negative concord (NC) is the indication at multiple points in a clause of the fact that the clause is to be interpreted as semantically negated. In a widely spoken and even more widely understood nonstandard dialect of English, sentences (1) and (2) are interpreted as synonymous with those given as glosses, which are also well-formed in the dialect. The examples in (3) from Italian and (4) from Catalan illustrate the same phenomenon.

The occurrence in these sentences of two or three different words, any one of which when correctly positioned would be sufficient to negate a clause, does not guarantee that their interpretation involves two or three independent expressions of negation. These clauses express only one negation, which is, on one view, simply redundantly indicated in two or three different places; each of the italicized terms in these sentences might be seen as having an equal claim to the function of expressing negation.

However closer inspection indicates that this is not the correct view. Not all of the negative terms in (1)-(4) are redundant; if the first negative phrase in each of these sentences is removed or replaced by an appropriate nonnegative phrase, the sentences become ungrammatical, losing their NC construal. Apparently the first negative item in each of these sentences has a better claim to expressing the negation of the clause than the others do.[1] So we might pose the question: which of the occurrences of negative phrases in a clause showing negative concord expresses the negation?

---

[*] This research was supported by NSF Grant BNS-9021398. Earlier versions of this work have benefitted from comments by a number of people. I am grateful for comments on this version by my colleagues Judith Aissen, Sandra Chung, Donka Farkas, James McCloskey, and Louise McNally, as well as the SALT II audience.

The title of this paper derives from this question. I will investigate the assumptions behind it, clarifying what I mean by 'expressing negation'. My proposal will be a form of objecting to the presupposition of the question. I will outline a view on which none of the negative terms in these clauses directly expresses negation. Rather, I will explore a theory of the interpretation of such clauses in which one does not associate a recognizable negation operator as the lexical interpretation of any of the visible formatives in the sentence, but rather with an abstract aspect of clause structure which must be licensed by a morphologically negative phrase.

The argument will proceed as follows: I will first discuss the reason that negative concord languages seem to pose a challenge for compositional interpretation and show that we can maintain standard assumptions about logical interpretation if we detach the expression of clausal negation from the lexical interpretations of the apparently negative terms. The analysis I propose will lean heavily on the notion of an indeterminate or indefinite argument familiar from Heim (1982). Doing so will provide a unified way of viewing the relationship between negative concord and systems of argument negative polarity items. I will then argue that the proposed analysis can be the basis for an explanation of an important generalization about how negative concord languages systematically differ from languages which do not allow concord. In doing so, I will draw on insightful work in the syntax of negation by, among others, Zanuttini (1988, 1991) and Laka (1990), without doing justice to the details of the syntactic argumentation in those works. This discussion is intended as a contribution on the semantic side to the debate about how apparently negative terms in such languages should be interpreted.

In developing this paper, I attempt to maintain a studiously ambivalent stance on the relation between the interpreted structures and surface syntactic structure. I do so in an effort to try to demonstrate that the abstractness of the proposal is at least initially consistent with a range of views of logical form.

Challenge for Compositional Semantics?

Let us begin by examining in some detail the view on which negative concord might seem problematic for semantic interpretation by asking ourselves:

---

[1] As stated, this is not a general property of NC clauses. The negative subject in ***nobody never telephoned me*** may be replaced without loss of the expression of negation or grammaticality.

what meaning shall be assigned to the expressions *nobody, nothing*, and *not* ?[2] The rich algebra of Montagovian type-theory provides a variety of options for appropriate denotations. For the two argument expressions, the theory of generalized quantifiers provides a ready interpretation: the set of sets or properties which are disjoint from a base set of persons or non-persons. For the particle *not*, the simple truth-function or a function mapping propositions into their complement propositions would suffice. For those concerned that the syntax of *not* suggests that it is adjoined to VP and therefore should have an interpretation which combines directly with the unsaturated meaning of the VP, a function mapping properties into their complements will give the right result. For those convinced that despite the VP-adjoined syntax of *not*, the subject position should fall in its scope, a raised type assigned to the VP, one which expects a generalized quantifier as argument, will do the trick. In any event, it is easy to assign denotations to these elements which allow them to express negation in the sense, following Zwarts (ms), that their interpretations are functions which are anti-additive[3]. The assignment of interpretations which express negation to these morphologically negative phrases predicts that each instance will express an independent negation.

As long as we restrict ourselves to non-NC languages like standard English, a straightforward interpretation procedure will yield a plausible answer for a sentence like (5), one which entails that Mary talked to somebody. That is because the negation expressed by *didn't* will cancel the negation expressed by *nobody*.

(5) Mary *didn't* talk to *nobody*.

But confronted with the interpretation of (5) under a negative concord construal, we are presented with a problem: If both *didn't* and *nobody* express negation, then something must be done to rid ourselves of one of the expressions of negation. Thus negative concord looks like a problematic construction. However we know that negative concord is a wide-spread phenomenon, one might even speculate that it is the unmarked case. So it behooves us to examine in some more detail what the assumptions underlying the straightforward procedure for semantic interpretation lead us to this conclusion.

I will refer to the structure which is semantically interpreted as 'logical form' and make reference to it as lower-case *lf* (to reserve *LF* specifically for *lf* in GB). The following seem to me to be fairly widely-accepted assumptions about the relation between logical form in this general sense and surface syntactic structure. In general, logical forms are assumed to be conservative in that to the extent possible, the formatives of surface structure are formatives of lf. That is, the units of surface structure are treated as basic expressions for interpretation unless there is good reason to relate them to multiple units of lf. Further, the structural relations in s-structure have correspondents in structural relations in lf. These conservative assumptions are common to views of lf ranging from attempts at surface interpretation to the standard view of LF in GB.

---

[2] I will discuss NC in terms of English clauses like (1) and (2) and English phrases, though I intend these to be representatives of parallel structures and phrases in other NC languages.

[3] There are a range of algebraic properties which can be identified across these functional types as negation of various strengths. Here I assume that a phrase *expresses negation* iff its interpretation is anti-additive. A function f is anti-additive iff $f(A \vee B) = f(A) \wedge f(B)$.

Of most relevance to this discussion of NC is the assumption about the formatives of lf, because much of the discussion of the interpretation of NC revolves around the question of how many ways argument expressions like *nobody* can be interpreted in logical form. An lf can be less conservative with respect to its treatment of a s-structure formative like *nobody* in two ways: the s-structure formative can be decomposed in lf, so that it corresponds to multiple basic expressions of the lf language, or it can be mapped onto two (or more) distinct basic expressions of lf. In the discussion below, we will be interested in a relaxation of conservativity which relates terms like *nobody* to two lf constituents, a negative and a nonnegative one.

An interpretation for lf assigns interpretations to the basic ('lexical') elements of the lf language. Another standard assumption is that such interpretations are assigned to basic phrases qua types, not tokens. That is, lexical meaning is not assigned context-sensitively; the lexicon (of lf) stipulates interpretations for lexical items without reference to their embedding context or other elements in the lf.

To illustrate this assumption, let us consider briefly an analysis of NC which proposes that the language of lf contains a single formative *nobody*, but the assignment of its lexical interpretation is structure-sensitive: it is interpreted as the generalized quantifier $\lambda P[body' \wedge P = \varnothing]$ in subject position and a non-negative meaning in non-subject position, say $\lambda P[body' \wedge P \neq \varnothing]$, which is the complement of its negative interpretation. Under these assumptions, (5)-(7) would be given correct NC interpretations, with the negation expressed either by the inflected auxiliary or the term in subject position.

(6) Nobody talked to Mary.
(7) Nobody talked to nobody.
(8) Nobody didn't talk to Mary.
(9) Mary talked to nobody.

Sentence (8) will be interpreted as in standard English, with the two negative terms expressing independent negations.[4] However note that such an account has a serious flaw; it predicts that (9) will mean that Mary talked to somebody. The status of clauses like (9) will be of interest to us later, but as an independent sentence, (9) would never have this meaning in any of the languages we are concerned with; it would be ill-formed. The status of (9) highlights the fact that a context-sensitive interpretation of terms in a NC clause would be relational in the sense that the assignment of meaning would not depend only on structural position but also on the presence of other items in the clause. That is, crucial to assigning *nobody* the non-negative interpretation in (5) is the fact that it occurs in a VP under the scope of another negative expression. A similar point could be made about *never*, which when it precedes the tensed verb will express negation if the subject does not, but will not express negation if the subject does.

---

[4] This follows from the assumption that *didn't* here always expresses negation. As will be discussed in more detail below, the pattern in (5)-(6) is appropriate for one dialect of English and languages like Italian, but not for another dialect of English and languages like Catalan.

I know of no one who has defended abandoning the assumption that lexical interpretation assignment is context-free and I will not either. Whatever the basic expressions of lf are, they must receive interpretations as types not tokens and so if we must interpret some tokens of negative phrases in one way and some in another, they must be distinct basic expressions of lf and their distribution must be determined by the principles governing the definition of well-formed lfs.

Hence I conclude that interpreting NC forces us to consider the possibility that the language of lf contains distinct negative and non-negative phrases corresponding to the terms in the negative concord clause; the formatives of lf will be systematically richer than the formatives of s-structure. We can illustrate the difference with the following sketch of a different account: The item *nobody* is ambiguous between two basic expressions of lf: *nobody[+]* and *nobody[-]*. The former is always interpreted as $\lambda P[body' \wedge P \neq \varnothing]$ and the latter as $\lambda P[body' \wedge P = \varnothing]$. The problem posed for interpreting sentences (5)-(9) becomes a problem of determining which occurrences of *nobody* in s-structure correspond to *nobody[+]* and which correspond with *nobody[-]* in lf. However that is determined, the assignment of an interpretation to these two lf phrases will be univocal and context-free.

We hereby turn a putative context-sensitive assignment of meaning into a more familiar syntactic problem: determining the distribution of these two items in well-formed lfs. Following the (ultimately inadequate) suggestions above, the interpretations of these sentences could be determined by assuming that *nobody* corresponds to *nobody[-]* in subject position and *nobody[+]* elsewhere. The problem raised with (9) could be handled by a further requirement that *nobody[+]* be licensed by occurring only in the scope of some expression of negation.

The conclusion of the discussion in this section then should be that NC does not really constitute a challenge for compositional semantics. Rather negative concord focuses our attention on the principles that determine the relationship between the naive notion of lexical formatives in a language and the basic phrases of lf. In particular, it focuses us on the question of how to relate the morphosyntactic notion of negative which unites the terms in the concord relation with the semantic property of expressing negation and it narrows our examination to proposals which relate concordant terms to two distinct, complementary elements of lf.

Negative Incorporation/Absorption

We now turn to the question of which of the items in a negative concord clause express negation and the new question of how the distribution of the lf correspondents of these terms is determined. In analyzing clauses like (5)-(9) above, we assumed that only the occurrences of *nobody* in subject position express negation; other occurrences do not. So we must propose principles which insure that *nobody[-]* occurs only in subject position and *nobody[+]* does not occur there.

Since the distribution of *nobody[-]* and *nobody[+]* is complementary and the meanings assigned to the two are boolean complements, a solution can be framed as a projection problem of s-structure *nobody* onto *nobody[-]* and *nobody[+]*. Either *nobody[-]* or *nobody[+]* can be chosen as the default projection and the range of the other can be governed by a principle which changes the default into the marked item. When *nobody[-]* is chosen as the default projection, the principle governing the distribution of *nobody[+]* can be called 'negative absorption', in the sense of Higginbotham and May (1981); when *nobody[+]* is the default, the principle governing the distribution of *nobody[-]* can be called negative incorporation. We can illustrate the difference with two proposals for the analysis of NC in Italian.

In a recent discussion of negative concord in Romance and West Flemish, Haegeman and Zanuttini (1990:21-22) propose an absorption account in their rule of 'factorization', which applies in determining logical forms for NC clauses. Their rule is stated in (10):

> (10) In languages that show NC, when two negative quantifiers raise they undergo a process which we will informally call factorization: instead of creating two (or more) consecutive instances of a universal quantifier each followed by an instance of negation, negation is factored out and the two (or more) universal quantifiers become one binary (or n-ary) quantifier:
>
> 48.a$[\forall x \neg]\ [\forall y \neg]\ ([\forall z \neg]) = [\forall x,y(,z)] \neg$

The relation between this rule and the foregoing discussion is obscured by the fact that the formulation in (10) is influenced by some other considerations in their analysis which will not concern us here. First, they assume that negative arguments are to be interpreted as universal quantifiers taking scope over a negation operator and that this analysis is made explicit in the formatives of lf. I have assumed that the argument expressions are interpreted as existentials within the scope of a negation. Their treatment is motivated principally by the assumption that the universal nature of these terms is the determining factor in stating the distribution of particles which mean *almost*, and that the decomposition is required to capture that distribution. Since a full addressing of this motivation is beyond my intention here, I will assimilate their proposal to the assumption that NC terms are existentials within the scope of a negation in (10′):

(10′) In languages that show NC, when two negative quantifiers raise they undergo a process which we will informally call factorization: instead of creating two (or more) consecutive instances of an existential quantifier each preceded by an instance of negation, negation is factored out and the two (or more) existential quantifiers become one binary (or n-ary) quantifier:

$$[\neg \exists x]\,[\neg \exists y]\,([\neg \exists z]) = \neg[\exists x,y(,z)]$$

We can see clearly how this is a principle of negative absorption. The default lf correspondent of *nobody* would be $[\neg \exists z]$ and where the factorization rule applies, it will correspond with $[\exists z]$[5]. However since the decomposition of items like *nobody* into logical representations in the determination of lf is not a crucial part of an absorption analysis, its essence can be further distilled to the more conservative (10″).

(10″) In languages that show NC, after two negative quantifiers have raised they undergo negative absorption: every occurrence of a negative expression in the immediate scope of a negative expression is made nonnegative:

$$\underset{[-]}{\textit{nobody}}\ \underset{[-]}{\textit{nobody}} \Rightarrow \underset{[-]}{\textit{nobody}}\ \underset{[+]}{\textit{nobody}} \qquad \text{(Obligatory, iterative, bottom-up)}$$

This rule assumes that the negative value for *nobody* is the default interpretation for the concordant term and states the distribution of the nonnegative value. As stated, it is embedded in an analysis which assumes that these terms raise in the derivation of logical forms. As such it must apply to representations in which the primacy relations among the operators in lf mirror those of s-structure. If we assume this, then it guarantees that the nonnegative version of the quantifier will show up only under the scope of a licensing negation and the assumption that the rule applies iteratively, bottom up, guarantees that any cluster of negative quantifiers will be reduced to a single negation. What is responsible for NC on this analysis is the obligatory absorption principle.

The alternative negative incorporation approach can be illustrated by the analysis of Italian NC presented in Rizzi (1982). In that account, *nessuno* shows up in lf marked either [+neg] or [-neg]. He assumes that *nessuno* is [-neg] by default and interpreted as a negative polarity item. The negative construal, corresponding to our *nobody[-]* is assigned via the rule in (11) (p. 124):

---

[5] Ignoring the issue of combination into an n-ary binding operator.

(11) *nessuno* → [+neg] when c-commanded by VP.

This analysis guarantees that the item will be interpreted as negated only outside the VP (e.g. in subject position) and that all VP internal occurrences (necessarily not c-commanded by the VP node) will remain nonnegative. The assumption that the [-neg] occurrences of *nessuno* are negative polarity items of some sort guarantees that they must occur in the scope of something which expresses negation. Finally, assuming that there is at most one position in which *nessuno* could be c-commanded by VP entails that the clause will contain at most one negation expressed by *nessuno*. As Rizzi notes, this kind of analysis, which associates the expression of negation with an abstract aspect of clause structure rather than with the lexical interpretations of the apparently negative expressions in the sentence harks back to Klima's (1964) analysis of negation in English.

The absorption and incorporation solutions share some assumptions: (a) that the negative expressions of the language correspond to two different logical formatives, one expressing negation, and one not; and (b) that a rule governs the relative distribution of the one of the logical formatives. The differ principally in the claim about which generalization is easier to state: where negative phrases do not express negation (the absorption account) or where negative phrases do express negation (the incorporation account). Ideally each account would seek to eliminate as much of the stipulatory nature of its rule as possible by reducing its effects to other, known phenomena. One way of doing this is to propose that the duplicity of the negative argument expressions in lf is a reflex of a simple lexical ambiguity: that they are ambiguous between negative quantifiers and negative polarity items, which are known items of limited distribution. This idea has much to recommend it and we will pursue in the rest of this paper an idea which exploits this means of restricting the nonnegative lf correlates of surface negative phrases. Let us first consider the principles which govern the distribution of negative polarity items like *anybody*.

NPIs as 'Indefinites'

In sentence (12), the italicized items are negative polarity items (NPIs), which must be licensed by the occurrence of an appropriate expression of negation. In (12), the negation marked on the inflectional head of the clause counts as the license for these items.

(12) Maria **didn't** say *anything* to *anybody*

Negative polarity items have been traditionally considered to be 'indefinites', and I believe it is best to interpret this in the sense of Heim 1982. An indefinite is an argument expression which has descriptive content but no inherent quantificational or referential force. It composes with other expressions to yield parameterized meanings. These parameters are grounded, typically by existential binding, at some point in the interpretation. According to Heim's original proposal, these parameters must be grounded whenever they fall in the restriction or nuclear scope of an operator, a category into which negation should clearly fall. The operator that triggers the anchoring or binding of an indefinite I will call the *roof* of the indefinite.[6]

Negative polarity items like *any* and *ever* can be treated as indefinites which are subject to twin licensing requirements, one which holds of logical form and one which holds of surface structure. The logical form condition is that they must be roofed (and are hence never directly referential) and that their roof in lf must be an appropriately negative operator. I will temporarily pass over the question of how to characterize the notion 'appropriately negative' and whether negative polarity items differ from each other in what property they require of their licenses and roofs and concentrate on the existence of the other condition, the surface structure licensing requirement. This requirement is illustrated by the ill-formedness of (13), where a negative-polarity item appears in subject position.

(13) *Anybody **didn't** say anything to anybody

Despite plausible arguments that clausal negation can take the subject position in its scope, it cannot license negative polarity items there. What is true of well-licensed polarity items (at least in single clause sentences) is that they are always c-commanded by a licensing expression in surface structure. Note that a non-NPI indefinite which does not have any s-structure licensing requirement can occur in the same position and be roofed by negation:

(14) A train didn't arrive for four hours.

The existence of this s-structure c-command requirement for licensing (and its locality) plays an important role in Progovac (1988), which explores the parallels between the polarity item licensing system and binding-theoretic accounts of the distribution of pronouns and anaphors. Returning to the interpretation of (12), we can see that both the NPIs are licensed in s-structure by the c-commanding *didn't* and that (13) can be interpreted only based upon a logical form in which the NPI indefinites are roofed (and existentially closed) by the negation operator expressed by *didn't* .

Among the things which recommend the view of NPIs as indefinites is that it explains what Linebarger (1980) called the immediate scope constraint. She pointed out that simply requiring that NPIs be in the scope of some negation in logical form was too liberal a license: if some logical operator intervenes between the negation and the polarity item, the item will not be licensed. This can be illustrated by considering the sentence (15).

---

[6] Sometimes the roof of an indefinite is also its binder, but in the cases that we will be interested in, it is typically not.

(15) a. Meg didn't read every book to a student.

b. $\neg(\forall x{:}book(x))\ (\exists y{:}student(y))\ [read\ (Meg, x, y)]$

I think that it is easy to construe this sentence with the interpretation given by the formula (15b): Not every book got read. If the NP *a student* is interpreted as an indefinite, then it may be roofed by the universal quantificational NP, which in turn falls in the scope of the negation. The other five logically possible construals are less accessible for various reasons, but what is relevant is that (15b) is a possible construal. However if we substitute a negative polarity indefinite for *a student*, as in (16), this construal disappears.

(16) Meg didn't read every book to any student.

A construal of (16) parallel to (15b) is ruled out by Linebarger's Immediate Scope Constraint, which stipulates that no operator can intervene between the license and the item. On the view adopted here, it follows automatically from the treatment of these items as indefinites because the lf condition for the NPI is not met on such a construal: though the NPI indefinite is in the scope of a licensing operator, it is not roofed by it.[7]

From this brief examination of negative polarity items I will take three points: the plausibility of analyzing negative polarity items as indefinites; the fact that a language may provide a range of items which are 'indefinite', but subject to differing licensing conditions; and that in the case of NPIs, the licensing involves both a requirement on logical form and one on s-structure.

Reducing Concordant Terms to NPIs

We embarked on the discussion of negative polarity items as a prelude to reducing the distribution of the non-negative correspondents of negative terms in lf to the theory of NPIs. The hope is that the theory of NPI licensing can eliminate the need for a special absorption or incorporation rule as part of the determination of lf.

Assuming that negative terms are systematically ambiguous between expressions of negation and NPI indefinites, one interpretation of a NC clause like (2) would be exactly that sketched for (12), with the NPI version of *nobody* substituted for *anybody* and with *didn't* as the s-structure license and lf roof for the indefinites. In any well-formed NC structure, there will always be one negative phrase which c-commands all the others in s-structure. In a clause like (1), the subject phrase will not be interpretable as a NPI, as it would not be licensed in s-structure; it must be interpreted as an expressor of negation.

---

[7] It follows assuming that in these cases the indefinites cannot be assigned scope higher than the clause in which they occur. An analysis in terms of indefinites also cleans up the problem of licensing multiple NPIs which complicates a structural formalization of the constraint.

The attempted reduction of the distribution of the absorption/incorporation analysis to an ambiguity between negative quantifiers and NPIs has this to recommend it: half of the action of the absorption or incorporation rule will follow automatically: the NPI terms will always be s-structure licensed and If roofed by an expressor of negation. However as it stands, it falls short in several ways as complete theory of negative concord.

One concern is that the class of licensing operators for NPIs like *anybody* is systematically broader than the class of licenses for negative concord terms. While a wide range of expressions with monotonically decreasing but not anti-additive interpretations license *anybody*, only '*n*-negations' license the concord terms. However it is likely that polarity items in a language differ from each other in their 'strength', that is, in which requirements they impose on their roofs. That is, while some polarity items are happy to be roofed by monotone decreasing operators, others require anti-additive roofs. It could be that the difference between concordant terms and other NPIs in the language falls within this normal range of variation. So let us assume that a semantic characterization of the property of negative concord licenses can be given and proceed, noting that there are differences between the licensing of NPIs in concord relations and other NPIs.

Closer examination of the consequences of the proposal will stretch our notion of NPI in another way: in some languages the negative phrases associated with the head of the clause must be viewed as concordant terms and allowed an NPI interpretation. The English dialect in which (17a) and (17b) are synonymous (or languages like Catalan, cf. (18)) commit us to seeing *didn't* (or, respectively, *no*) as not expressing negation.

(17) a. Nobody said nothing
b. Nobody didn't say nothing
(18) a. *Ningú* ha vist en Joan. — Nobody has seen John.
b. *Ningú no* ha vist en Joan. — Nobody has seen John.

This is because, the English dialects in which (17b) is negative concord do not allow an *any* type NPI in subject position (Cf. Labov 1972). We are led to the conclusion that in such sentences, *didn't* or *no* does not express negation. The sense in which it is meaningful to call *not* or *no* a negative polarity item remains to be explored, but the need to be able to rob these apparent archetypal expressors of negation of their ability to do so seems clear.[8]

Having noted these two points, we turn to more serious concerns. If we assume that negative terms are systematically ambiguous between expressors of negation and NPIs, the difference between a negative concord language and a non-negative concord language is a pattern of lexical ambiguity. A language which does not allow NC is presumably one which does not allow NPI interpretations for any of its negative phrases. Since lexical ambiguity is generally seen as an item-by-item affair, this suggests that we might find NC languages with a mix of NC properties for its items, e.g. *nobody* participates in NC but *nothing* doesn't. *Never* does participate in concord, but *nothing* and *nobody* don't. As far as I know, there are not any such languages.[9]

---

[8] The analysis which I propose below will not eliminate the need to consider these items as non-expressors of negation in these languages.

There are two more points on which our attempted reduction must be strengthened. First, it contains nothing to block the inference that there is no such thing as a purely NC language, i.e. on which does not also allow interpretations of these clauses as expressing multiple negations. The absorption/incorporation rule enforces a complementary distribution on the lf correspondents of negative terms. The theory of negative polarity items restricts the distribution of the NPIs but does nothing to restrict the distribution of the negative expressors (beyond requiring that there be one if there are any NPIs). In a language which is strictly negative concord, something must be added to restrict the distribution of the negative quantifiers. Otherwise every sentence which contains multiple negative phrases should have both a double negation (DN) and a NC construal. One possible reaction would be to classify all of the negative expressors as strong 'affirmative polarity items'. However doing so aggravates further the concern that the locus of difference between NC and DN languages is a pattern of item-by-item stipulations in the lexicon and it does nothing to correlate the presence of NC with the absence of a DN reading.

Structural Condition on the Expression of Negation

Finally, I think that there is a failure of explanation of the syntactic constraints on NC. The analysis as it stands gives no reason to think that the possibility of NC construal would have syntactic restrictions on it apart from the requirement that NPI concordant terms would all be c-commanded by a negative-expressing term. That is, parallel to negative polarity licensing like (19a), we would expect (19b) to have a negative concord reading.

---

[9] There ARE variations, but these treat all the simple argument expressions as one class, opposed (sometimes) to syntactically complex argument expressions, and the non-argument, INFL associated items.

(19) a. She gave ***nothing*** to *anyone*
b. She gave ***nothing*** to *nobody*.
c. She ***didn't*** give *nothing* to *nobody*.

But in fact (19b) is not well-formed in NC English and structurally parallel cases are apparently never well-formed in a strict NC language. What (19b) should mean must be expressed by a structure like (19c), where the expressor of negation is associated with the head of the clause. In a NC language, it is impossible to express the negation only in the VP. This is characterized by Zanuttini (1991, 153) as the constraint in (20):

(20) Constraint on the assignment of sentential scope to negation: Negation can take sentential scope only if at s-structure it is in a position from which it c-commands both the Tense Phrase and the Agreement Phrase.

A quick survey of some negative concord languages will illustrate this claim. The sentences in (21) from Italian exemplify NC clauses. (21a) and (21b) show that any number of argument expressions in the VP can be concordant with the negative adverb *non*. (21c) and (21d) show that *nessuno* in subject position can express negation and have argument negations concordant with it. (21e) shows that postverbal subjects can be concordant with *non*. The condition of interest here is what is responsible for the ungrammaticality of (21f) and (21g), in which the only expressions of negation are in the VP.[10]

(21) a. Mario ***non*** ha visto *nessuno*. Mario has seen noone.
b. Mario ***non*** ha parlato di *niente* con *nessuno*. Mario hasn't spoken with anyone about anything.
c. ***Nessuno*** ha visto Mario. Nobody has seen Mario.
d. ***Nessuno*** ha parlato con *nessuno*. Noone has spoken with anyone.
e. ***Non*** ha telefonato *nessuno*. Nobody telephoned.
f. *Mario ha visto *nessuno*.
g. *Ha telefonato *nessuno*. Nobody telephoned.
i. ****Nessuno non*** ha visto Mario.

As the data in (22a) and (22b) indicate, the facts for Spanish are parallel. *Nadie* in the VP is not sufficient to negate the clause.

---

[10] Alessandro Zucchi reported in comments after the SALT presentation that his native dialect of Italian seemed to depart from the standard Italian judgements expressed here in allowing sentences like (f) and (g), in effect counterexemplifying the claim made here. The question of whether such a language can be described within the system outlined below without reducing its empirical claims to vacuity remains open at this point and a question for further investigation.

(22) a. *(No) vimos a nadie. We didn't see anyone
.b *(No) comió nadie. No one ate.
.c Nadie (*no) comió. No one ate.

Among the various English NC dialects, two can be distinguished by the data in (23). The pattern of NC in column A is exactly parallel to the Spanish and Italian cases. The ungrammaticality of (23d) would explained by the requirement that the expression of negation must be high enough in the clause structure to c-command the head of the clause.[11]

(23)		NC-A	NC-B
a.	Nobody said nothing	NC	NC
b.	Joan didn't (never) say nothing	NC	NC
c.	Joan never said nothing	NC	NC
d.	Joan said nothing	*	*
e.	Nobody didn't say nothing	DN or *	NC

Finally, the ungrammaticality of (24b) and (24d) shows that Catalan shows the same property.

(24) a. En Pere *no* ha fet *res*. Peter has done nothing.
b. *En Pere ha fet *res*.
c. *No* m'ha telefonat *ningú*. Nobody has called me.
d. *M'ha telefonat *ningú*.
e. En Pere *(*no*) renta *mai* els plats dishes Peter never washes the
f. *Ningú* (*no*) ha vist en Joan. Nobody has seen John.
g. En Pere *mai* (*no*) fa *res* Peter never does anything.

Licensing the Expression of Negation

So where are we? I have surveyed the field of approaches to the interpretation of NC. We have concluded that the solution to NC must be part of the determination of logical form in the general sense, and delimited two approaches: the absorption analysis, which assumes that the basic meaning is negative, and the incorporation analysis, which assumes that the basic meaning is nonnegative. This led to a consideration of whether the details of either approach would follow from the proposal that the items were ambiguous between negative quantifiers and negative polarity items. Along the way, we noted that the theory of polarity licensing entails conditions which are met at s-structure and conditions which are met at lf. I faulted the ambiguity proposal on two main points: that it did nothing to correlate the absence of DN readings with the presence of NC construals and it gave no reason to expect a structural condition on the expression of negation.

---

[11] I am assuming that these sentences should count as ungrammatical in these dialects, though the judgement from native speakers that one is likely to get in such cases is that it is understood but just 'not the normal way of saying it'. I assume that the fact that speakers of these dialects do not reject such sentences completely is due to the influence of the standard dialect of English.

Now it is time to propose a final account. Let us first remind ourselves what we mean by an item expressing negation: that it be interpreted as a function which is anti-additive. Let us consider the sentences we have been analyzing again and ask two questions. What is the evidence that it is possible for negative terms not to express negation? The mere existence of NC clauses offers that evidence. This was the 'challenge' to compositional interpretation. Once these items are given interpretations which express negation, they should be able to express negation wherever they occur. Every negative concord clause with *n* negative phrases must contain *(n-1)* occurrences of a negative phrase that does not express negation.

Now, what evidence is there that these items can express negation? Interestingly, I think that we find much less. All we can find in a negative concord language is, typically, that clauses containing these items are in fact interpreted as negated, but that is not the same thing. In fact, the discussion around (20) above shows that the presence of one of these items in a clause is not in fact sufficient condition for the expression of negation. If we find evidence that individual instances of these items express independent negations within the same clausal domain, that would count as evidence. So DN languages are presumably languages in which these terms do in fact express negation. But in a NC language in which only one of these expressions can express negation in a particular clause, the way is open for proposing that the negative phrases in fact never express negation. In effect, we could propose that they are univocally interpreted as NPI indefinites and that it is not necessary that any visible formative of S-structure actually express negation.[12]

But if that is true, how does the negation get expressed and how are these polarity items licensed? Recalling the discussion above, we see that we have two separate questions to ask: what items in the sentence license them and what operator in lf roofs them?

The answer to the second question must be: a negation operator, preferably (anti-morphic) negation. But where does that operator come from? It need not be part of a lexical meaning: it may be constructional, in the sense that it is associated with some structural feature not necessarily visible in the clause. Once we realize that, we are free to imagine that the negation operator can simply be added in at some point in the interpretation of a clause. But surely it cannot be added in 'willy nilly'. Its 'expression' must itself be licensed by something, and the license for the expression of negation can be these negative terms.

---

[12] In this respect my proposal agrees with Laka (1990), whoc treats all these phrases as NPIs. It will differ from her account in not requiring them to be s-structure licensed when they are licensors of the expression of negation.

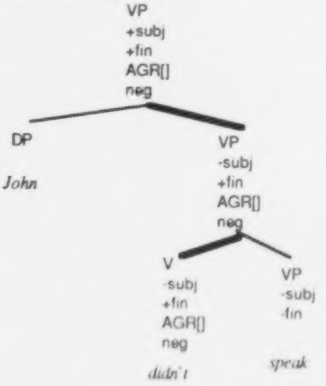
This sounds like sophistry: in NC languages, *nobody* doesn't express negation, but it licenses the (constructional) expression of negation. The difference *is* a sophisticated one, but I think a reasonable one to explore. To make the proposal clearer, I will work out the outlines of two forms of the analysis. The first will be a GPSG-style phrase structure analysis with a very conservative notion of lf. The second will be a mutation of that analysis into a GB-style analysis. I think that the essence of the two analyses are the same, but the further syntactic consequences of the second are perhaps more elaborate that those of the first.

Interpreting NC structures: GPSG

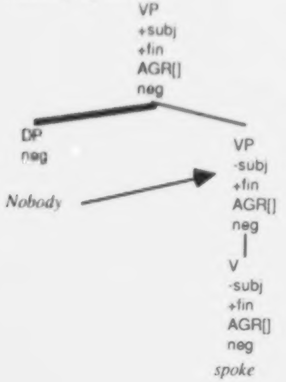
Assume that in the category structures of a language there is a feature [neg], the morphosyntactic feature inherently specified for all negative phrases. As with all features in GPSG, we must specify conditions which govern the distribution of this feature. Assume that its projection is governed by the Head Feature Convention of GKPS (Gazdar et al (1985)), so that its occurrence on a lexical head guarantees its occurrence on every projection of that head. Assume further that it is a semantically potent feature (GKPS, 224); that is, it plays a role in the interpretation of a structure. When the feature [neg] occurs on clausal nodes, it will trigger the application of a propositional negation operator to the propositional interpretation of the clause otherwise determined by the composition principles. By our definition then, it is the feature [neg] which expresses negation, not the lexical category which introduces it.

It follows from these assumptions that any clause whose head bears the feature [neg] will be interpreted as negated. This handles examples like (25), but does not yet handle the negation in structures like (26) and (27).

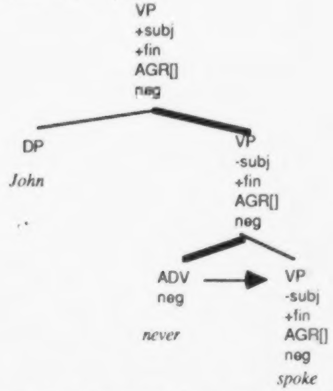
(25) John didn't speak.


VP
+subj
+fin
AGR[]
neg
DP
John
VP
-subj
+fin
AGR[]
neg
V
-subj
+fin
AGR[]
neg
didn't
VP
-subj
-fin
speak

(26) Nobody spoke.


VP
+subj
+fin
AGR[]
neg
DP
neg
Nobody
VP
-subj
+fin
AGR[]
neg
V
-subj
+fin
AGR[]
neg
spoke

(27) John never spoke.


VP
+subj
+fin
AGR[]
neg
DP
John
VP
-subj
+fin
AGR[]
neg
ADV
neg
never
VP
-subj
+fin
AGR[]
neg
spoke

To get the right result for these cases, we must assume that [neg] is also affected by the principle (28), akin to the Control-Agreement Principle.[13]

(28) A category inherits the feature [neg] from a specifier sister or an adjoined sister.

Augmented by this principle, we have an account of the expression of negation in languages like the B dialect of NC English and Catalan.[14] Assuming that all the negative argument expressions are univocally indefinites which are strong NPIs, i.e. must be roofed in If by a negation operator, we have an account of the pattern of negative concord. The semantic licensing requirement on *nobody* and *never* will be met because these indefinites will be roofed by the negation operator introduced at the clause level by [neg].[15] This also gives an account of the ungrammaticality in these cases of sentences like (29):

---

[13] The fact that a mother node will inherit the feature from a head daughter or a non-head daughter might suggest that [neg] acts like a Foot Feature. This possibility might be exploited in cases where it can be inherited from complement daughters as well, but for the languages considered here, this would not be the right result, as it would not provide a way of blocking the negation of the clause in *John talked to nobody*. Given that [neg] is a head feature, it is predicted to appear on the head of the clause as well. I have not followed out the consequences of this statement sufficiently to be sure that no untoward consequences of this result.

[14] These are the languages in which the [neg] element associated with the head of the clause may be concordant with a negative subject or preceding adverbial. I believe that the best account of the difference between NC English-A and NC English-B and between Italian and Catalan would involve a condition in the first language of each pair on the head-associated negation which requires that it not be c-commanded by another [neg] constituent in s-structure. However I will not pursue this point here.

(29) John talked to nobody.

The [neg] feature introduced by *nobody* will not be able to license the expression of the negation at the clausal level, and so qua NPI will not be properly roofed in the interpretation of the clause, rendering the sentence ill-formed.

It remains to ask what s-structure licensing conditions these [neg] NPIs have. It appears that either they differ from *any* items in having no s-structure licensing condition, or that they are self-licensing. I do not know if there is any empirical way to distinguish these two positions, but it is clear from (30) that the items which bear [neg] must count as s-structure licenses for the other NPIs.[16]

(30) Nobody ever left.

This analysis then resolves the questions raised above about the interpretation of NC in the following way. Why do clauses which show NC express only one negation even though they may contain multiple occurrences of [neg] phrases? Because there is only one node at which the feature is semantically potent.[17] Neither absorption nor incorporation are needed since the various argument terms serve only to license the expression of negation at the clausal node; they do not express negation directly. What is the basis for (20), Zanuttini's structural generalization about the expression of negation? These are the only positions in the structure from which the clause node is accessible by the assumed feature distribution principle (28). To the extent that (28) is stipulative, we might look for a way of reducing it to other known principles of feature distribution. But the effect of (28) is to license the instantiation of the feature [neg] on the head of the clause.

---

[15] The fact that items like *nessuno* in Italian can be licensed in polar interrogative complements though *nobody* in NC English cannot be is on this view a result of differing constraints on the operators which may roof these indefinites.

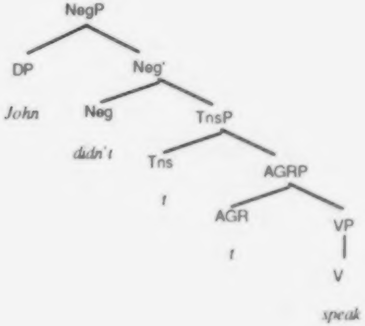
[16] This represents a departure from the theory of Ladusaw 1979, in which the property of being a license is defined only in terms of the interpretation of the item. If what is proposed here is sustainable, then these [neg] phrases are a class whose licensehood is defined morphosyntactically rather than semantically.

[17] The restriction to clausal nodes here is for illustrative purposes only. It is likely that there are other nodes at which the feature should be semantically potent. One view of the difference between NC languages and non-NC languages is that the latter may have DP as a domain in which the feature is potent, deriving the interpretation of *nobody* as the generalized quantifier which expresses negation.

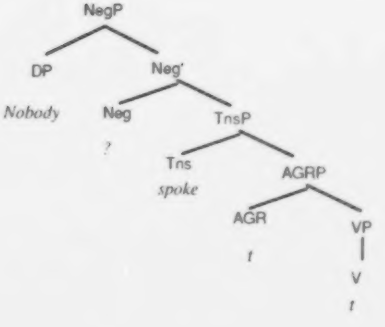
A GB-esque Account

The outlines on the syntactic side of a GB-esque version of the proposal can be derived from the discussion above by assuming that the features [neg], [fin], and [AGR], which in the GPSG account are part of a single clause-spine projection, are given independent projections as functional categories and that other principles and stipulations insure that the verb will move into the head position of some of these projections. Unfolded in this way, the trees in (25)-(27) become those in (31)-(33), ignoring the movement of the subject DP.

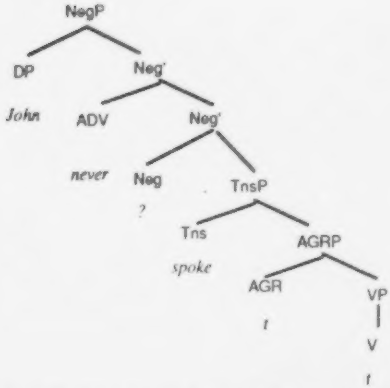
(31)


NegP
DP
Neg'
John
Neg
TnsP
didn't
Tns
AGRP
t
AGR
VP
t
V
speak

(32)


NegP
DP
Neg'
Nobody
Neg
TnsP
?
Tns
AGRP
spoke
AGR
VP
t
V
t

(33)



Clauses will either be projections of Tense^0 or Neg^0. Semantically, the composition rules for LF will contribute the negation operator to the interpretation structures rooted in NegP, but not to those rooted in TnsP.[18] The derivation of LFs from these s-structures would presumably involve the adjunction of the various negative argument expressions to NegP or TnsP. Interpreted as indefinites, they should be roofed by the negation operator which applies to the (maximal) NegP in the interpretation of LF.

As sketched here, the account assumes that (32) and (33) are NegPs, though there is no formative in the clause which necessarily serves as head, as there is in (31). These correspond to cases in the phrase structure account in which the distribution of the feature [neg] was passed to the clause projection via the principle in (28). In this account, we may ask what licenses the projection of Neg, the *?* in (32) and (33).

One approach to the question is a 'Neg Criterion', as discussed in Haegeman and Zanuttini, which makes use of Specifier-Head agreement. This covers half of the cases covered by (28), accounting for (32). But it is not immediately obvious how it extends to the case of (33), where the adverb is presumably not in a specifier position.

Another approach, which I will adopt here, is to see Neg^0 as a kind of NPI. But lest our notion of NPI get stretched too thin, let us immediately note that all we wish to assume is that Neg^0 is like an NPI in being subject to a surface structure licensing condition which mentions the feature [neg]. In (32) and (33), Neg^0 is properly licensed by being c-commanded by a negative phrase. In (31), it is self-licensed.

---

[18] I realize that the relative positioning of the various functional projections is a matter of debate and do not enter into that debate here. I also take no stand on whether the verb in (32) and (33) should move into Neg or not.

Conclusions

I have attempted to cover a wide territory in this discussion, cruising at a level of abstraction which I hope is not too high to see that there are some results here.

Basic assumptions about how syntactic analyses are to be given semantic interpretations focus the attention of the analyst of negative concord on the principles which determine lf in the general sense. We have surveyed a number of approaches to constraining the mapping between s-structure and lf to account for negative concord, and proposed that the account which makes the least novel stipulation about NC would be one in which concordant terms are interpreted as indefinites and the expression of negation is done abstractly, not by assigning argument phrases interpretations which express negation.

The theory of negative concord and the licensing of NPIs require attention to both structural conditions satisfied at s-structure and semantic conditions satisfied at lf. The former guarantee that a expression of negation is licensed at a fairly superior position in a clause. The latter guarantee that the phrases which are interpreted as indefinites can be conventionally particular about the semantic properties of their roofs. The idea that each language can choose among the range of options still leaves a wide area of 'wiggle-room' for systems of negation.

However given the variation in the syntactic requirements on negative phrases in various languages, it seems best for the time being to leave the semantic side of the theory general, consisting only of the theory of indefinites and their roofs, while detailed accounts of both the structures of individual languages *and* their semantic interpretations are worked out.

References

Gazdar, Gerald, Ewan Klein, Geoffrey K. Pullum, and Ivan A. Sag. 1985. *Generalized Phrase Structure Grammar*. Cambridge, MA: Harvard University Press.

Haegeman, Liliane and Raffaella Zanuttini. 1990. Negative Concord in West Flemish. University of Geneva, MS.

Heim, Irene. 1982. *The semantics of definite and indefinite Noun Phrases*. Ph.D. Dissertation, University of Massachusetts/Amherst.

Higginbotham, James and Robert May. 1981. Questions, quantifiers, and crossing. *The Linguistic Review* 1. 41-79.

Klima, Edward. 1964. Negation in English. J. A. Fodor and J. J. Katz, eds. *The structure of language*. Englewood Cliffs, NJ: Prentice-Hall.

Labov, William. 1972. Negative attraction and negative concord. *Language* 48, 773-818.

Ladusaw, William A. 1979. *Polarity sensitivity as inherent scope relations.* Ph. D. dissertation, The University of Texas at Austin.

Laka, I. 1990. *Negation in syntax: On the nature of functional categories and projections.* PhD. dissertation, MIT.

Linebarger, Marcia. 1980. *The grammar of negative polarity.* Ph. D. dissertation, MIT.

Progovac, Ljilijana. 1988. *A binding approach to polarity sensitivity.* PhD dissertation, University of Southern California.

Rizzi, Luigi. 1982. Negation, WH-Movement and the null subject parameter. *Issues in Italian Syntax.* Dordrecht: Foris Publications. 117-184.

Zanuttini, Raffaella. 1988. Two strategies for negation: evidence from Romance. *Proceedings of the fifth ESCOL.*

Zanuttini, Raffaella. 1991. *Syntactic Properties of Sentential Negation: A Comparative Study of Romance Languages.* University of Pennsylvania, Ph.D. Dissertation.

Zwarts, Frans. ms. Four facets of negation. UCLA and Groningen University.

Cowell College
UCSC
Santa Cruz, CA 95064

ladusaw@ling.ucsc.edu

On the Interpretation of Three-Dimensional Syntactic Trees

Friederike Moltmann
Massachusetts Institute of Technology

Introduction

Within generative syntax it has been proposed that coordinate sentences should be analysed by three-dimensional phrase markers (cf. Goodall 1985, Muadz 1991). We will show that three-dimensional syntactic trees allow for a syntactically and semantically adequate treatment of a certain type of coordinate construction which has often puzzled syntacticians working on coordination as well as semanticists working on plurals. The construction is illustrated in (1).

(1) John bought and Mary sold a total of ten cars.

In the reading that is relevant here, (1) can describe a situation in which John bought four cars and Mary sold six other cars. In this construction, roughly speaking, an element that may take a collective 'antecedent' takes an 'antecedent' that consists of parts of conjuncts. Thus, in (1) the 'antecedents' of *a total of* consists of the parts of the clausal conjuncts *John* and *Mary* and *bought* and *sold*.

On the basis of a slight extension of Muadz' theory of coordination and general rules of how to interpret three-dimensional syntactic trees, we will show that the construction in (1) can receive an analysis that explains a number of syntactic and semantic peculiarities of the construction.

1. The phenomenon

Let us first introduce some terminology that will facilitate the discussion. In the description of (1) we have said that *a total of* takes a collective 'antecedent'. Clearly *a total of* does not take an antecedent in the traditional sense in which an antecedent refers to an entity the anaphor refers to. But still expressions like *a total of* require a syntactic relation to some other elements in the sentence in order to be semantically evaluated; for instance *a total of* in (1) is related to both the NPs *John* and *Mary* and the verbs *bought* and *sold*. In this more general sense, I will refer to those other elements as 'antecedents'. As a 'collective antecedent' I will refer to an antecedent that denotes a group entity. For instance, plural NPs or conjoined verbs can be collective antecedents.

The construction exemplified by (1) appears in a variety of ways with a variety of elements taking a collective antecedent. This is illustrated in (2) - (4) with four different constructions, some of which occur both with IP and NP conjunction.

Right Node Raising
(2) *John* solved and *Mary* will solve the *same* problem / *related* problems / two problems *each*.
Relative Clause Extraposition

(3) a. Mary met a *man* and John met a *woman who knew each other well*..
b. every *man* and every *woman who danced together*

ATB wh movement

(4) a. How many books *each* did *John* write and *Mary* read?
b. Which pictures of *themselves* did *John* like and *Mary* hate?

IP/NP adjunction

(5) a. On the *same* day / *Together* / *Independently* / *Simultaneously* Mary *sang* and John *played*.
b. a *man* and a *woman* from the *same* city / with *similar* interests / with *a total of* ten relatives

In (2), we have the internal reading of *same* and *related* which take the parts of the conjuncts *John* and *Mary* as antecedents or *solves* and *will solve* given the view of Carlson (1987) and Moltmann (to appear), in which relational adjectives in the internal reading take events as antecedents. So-called binominal *each* in (2), a construction discussed most extensively by Safir/Stowell (1988), takes *John* and *Mary* together as a plural antecedent. In (5) the 'collective adverbials' *together*, *independently* and *simultaneously*, which take group events as semantic antecedents, take *sang* and *played* together as syntactic antecedents (see Lasersohn 1990 for an event-based analysis of *together*) .

Constructions such as (1-5) have been noted in various places in the literature. For relational adjectives and *a total of* in NPs in Right Node Raising constructions, the construction has first been noted by Abbott (1976). (See also Gazdar et al. 1982.) For relative clause extraposition, the construction has been discovered by Perlmutter/Ross (1970). For adverbs containing relational adjectives and collective adverbials such as *together*, the construction has extensively been discussed by Jackendoff (1977). All these authors have essentially only mentioned the constructions as a problem for traditional syntactic and semantic accounts of coordination and plurals, without making a general attempt of a syntactic or semantic solution. The semantic analysis of Link (1984) is restricted to relative clauses with NP coordination.

The elements that may enter the construction in English include *a total of*, relational adjectives, binominal *each*, plural reflexives in picture NPs and collective adverbials. This might suggest that in fact all elements that take collective antecedents may enter the construction. However, this is not the case. In English, for instance the reciprocal *each other* and simple plural reflexives may not enter the construction:

(6) * *John* hates and *Mary* likes *each other* / *themselves*.

Furthermore, languages differ with respect to which elements may take a collective antecedent consisting of parts of conjuncts (see Moltmann, forthcoming).

An important constraint, which we will note at this point in order to characterize the construction appropriately, is the restriction to coordinate structures. That is, the parts constituting the collective antecedents have to belong to different conjuncts. This is seen in (7).

(7) a. * A *man* saw a *woman who had danced together*.
b. * John met a *man* with a *dog who were quite similar*.

Let us now clarify why exactly the constructions in (1-5) present a problem for the traditional views on coordination and plurals.

2. The problem

The problem that the construction in (1-5) poses is that there is no syntactic structure compatible with standard assumptions that could provide the basis for a semantic interpretation compatible with standard assumptions. Consider (1). There are two possible syntactic structures on which the interpretation of (1) could be based. However, it can easily be seen that both of them yield the wrong semantic result. First, (1) cannot be interpreted as if *a total of ten cars* were in a position in each conjunct. That is, (1) cannot be interpreted as (8), which clearly means something different.

(8) John bought a total of ten cars and Mary sold a total of ten cars.

Second, (1) in the relevant reading cannot be interpreted appropriately if *a total of ten cars* was related to two traces in the two conjuncts, as in (9).

(9) [John bought t and Mary sold t] a total of ten cars.

The only way to evaluate (9) in a way different from (7) would be the following. *A total of ten* counts the cars that John bought and that Mary sold. But this implies that John bought the same cars that Mary sold. But crucially (1) can describe a situation in which John bought five cars which are different from another five cars which Mary sold.

The interpretation of *a total of ten cars* is unproblematic when *John* and *Mary* and *bought* and *sold* are coordinated by phrasal conjunction as in (10).

(10) John and Mary bought and sold a total of ten cars.

Here *and* is not Boolean *and*, but rather the *and* of group formation, which yields for *John and Mary* a group term referring to John and Mary as a group and for *bought and sold* a predicate describing group events of selling and buying. (See Link 1983 and others for the interpretation of *and* by group formation.)

Clearly, one would expect that the same semantic operation evaluating *a total of* in (10) applies to (1). Furthermore, as is most commonly assumed, one might want to maintain the principle that group formation as a semantic operation of sentence semantics is restricted to plurals and categories conjoined by *and*.[1] Thus group formation should not apply to the relevant terms in (1). Let me call these two assumptions 'the assumption of semantic invariance' and 'the assumption of the syntactic basis of group formation'.

(11) The Assumption of Semantic Invariance

The same semantic rules apply for the interpretation of *a total of, same, each* etc. in (1-5) as apply in 'simple plural sentences' such as (10).

(12) The Assumption about the Syntactic Basis of Group Formation

Group formation (as part of sentence grammar) can apply to constituents only on the basis of the category plural or *and*.

Thus, the construction under discussion constitutes a problem precisely because of the assumptions (11) and (12) on the one hand and standard assumptions about the syntactic structure of (1-5) on the other hand. In the next section, we will discuss possible approaches to handle the construction and then present our own.

3. The approach

The only way to deal with the construction is either to give up (11) or (12) or the standard assumptions about the syntactic structure. To give up (11) seems highly implausible. A more plausible approach to the construction could be based on abandoning (12).

Such an approach was taken by Hoeksema (1986) within the framework of Discourse Representation Theory (Kamp 1981). Hoeksema did not assume that group formation requires the category plural or *and*, but proposed that in the case of (1-5) it applies to discourse referents that have been introduced independently by the conjuncts. In this account, first *a man* and *a woman* introduce two discourse referents x and y in a discourse representation structure. Then the operation of group formation applies to x and y and yields a group discourse referent z. The relative clause now is evaluated with respect to the resulting discourse representation structure, modifying z.

The problem with this account is that it is far too unrestrictive. For instance, it cannot predict (and incidentally Hoeksema denies the facts) that the construction is possible only in coordinate structures. There are many other purely syntactic constraints on the construction that this approach, which relies on semantic flexibility, could not account for. We will come to some of those in section 5.

We will take a different approach. Instead of giving up standard assumptions about the semantics of group formation, we will give up traditional assumptions about the syntactic structures of the constructions in (1-5). That is, we will assume nonstandard syntactic structures. These syntactic structures are based on three-dimensional phrase markers.

Three-dimensional phrase markers have been proposed for coordinate structures within Generative Grammar most notably by Goodall (1987). For a number of reasons, though, we will not assume Goodall's conception of three-dimensional phrase markers, but rather the one developed more recently by Muadz (1991) (see Moltmann, forthcoming, for a comparison of the two theories).

The basic idea in employing three-dimensional phrase markers for the constructions in (1-5) is that the parts of the conjuncts that form the collective antecedents are 'implicitly coordinated'. Thus in (1) *John* and *Mary* and *sold* and *bought* are implicitly coordinated. Furthermore, we will propose that structures with implicit coordination receive two partial interpretations, one which evaluates the implicit phrasal coordinations, and one which evaluates the explicit clausal (or NP) coordination. These two partial interpretations have to be appropriately combined to yield the full interpretation of the sentence. Crucially, the evaluation of the sentence with respect to the implicit coordinations also evaluates the element taking a split collective antecedent. In this partial interpretation (1) comes out as roughly equivalent to (9) repeated here as (13).

(13) John and Mary bought and sold a total of ten cars.

(13), however, does not represent all the information represented by (1). In particular, unlike (1), (13) does not specify whether John did the buying and Mary the selling or John did the selling and Mary the buying or John and Mary together did the selling and buying, or perhaps John and Mary did the buying and Mary did the selling. However, this information will be represented in the second partial interpretation of (1).

In the partial interpretation of the clausal conjunction of (1), the semantic effect of *a total of ten cars* is disregarded and the NP is instead evaluated as a free variable, which will later be bound by an operator relating to *a total of ten cars* in the first partial interpretation. In fact the value of this variable will be a subgroup of the cars that *a total of ten cars* refers to. In this interpretation (13) comes out as roughly equivalent to (14).

(14) John bought some of the cars and Mary sold some of the cars.

(14) clearly specifies that John did the buying and Mary the selling.

In the next section , we will present the for the relevant features of the conception of three-dimensional phrase markers by Muadz (1991). Then we will extend Muadz' theory somewhat and introduce the notion of implicit coordination. After that, we will be able to show how a semantic interpretation of three-dimensional phrase markers can be conceived in general and how it applies to the syntactic structures proposed for the constructions in (1-5).

4. The syntactic background: Muadz (1991)

4.1. The basic idea

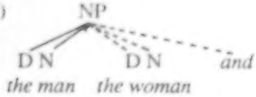
There are two basic ideas in Muadz' theory of coordination. The first one is that coordination consists in the base-generation of a node dominating several expansions which are not linearly ordered. This is captured by an extension of the usual phrase structure rules as in (14):

(14) $A \dashrightarrow \langle B_1, \ldots, B_n \rangle J$, where B_i is a legal expansion of A and J a coordinator.

Let me call a node that dominates several expansions a **'splitting node'**.

Given (14), *the man and the woman* will have the structure in (15), where the NP node is a splitting node dominating two expansions and a coordinator

(15)



Crucial in Muadz' theory is the notion of a **plane**. As defined by Muadz, a plane of a three-dimensional tree is a subtree which is obtained by selecting one of the expansions of each splitting node. Thus, in (15) we have two planes, one which consists in the subtree with the terminal nodes *the man* and another one which consists in the subtree with the terminal nodes *the woman*.

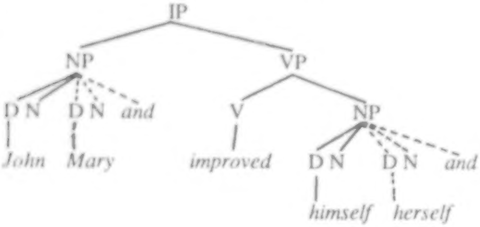
The second basic idea in Muadz' theory is that grammatical principles such as those of Theta Theory, Case Theory and Binding Theory apply to coordinate structures in the standard way, namely by applying to the individual planes.

Let us illustrate the assumptions of Muadz' theory with a more complex example, namely (16) in the 'respectively' reading.

(16) John and Mary improved himself and herself (respectively).

The syntactic representation of (16) is in a simplified fashion given in (17).

(17)



In the 'respectively' reading, (16) involves two planes, which are represented in (18):

(18) plane 1: John$_i$ improved himself$_j$.
plane 2: Mary$_j$ improved herself$_j$.

The verb *improved* and the V node dominating it are contained in both planes. Therefore, they are called **'shared nodes'**.

We see in (18) how Binding Theory applies in individual planes: *himself* is is in the ordinary way bound by *John* in the first plane and *herself* by *Mary* in second plane.

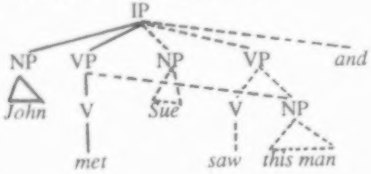
Muadz makes an important assumption about the semantic interpretation of three-dimensional trees. Three-dimensional trees are interpreted by evaluating the separate planes and combining the results by the semantic operation associated with the relevant coordinator. Thus (16) is interpreted by evaluating *John improved himself* and *Mary improved herself* and conjoining the results by Boolean conjunction. We will see later that if this assumption is to be maintained, the notion of a plane has to be modified. Otherwise it will lead, for instance, to an unlimited scope of a coordinator.

4.2. A further application: Right Node Raising

Muadz' applies his theory to another coordinate construction that is relevant for the present discussion, namely Right Node Raising (RNR). In Muadz' account, Right Node Raising structures do not come about by movement, but rather are base-generated. Nodes that 'have undergone' RNR are repesented by nodes that are dominated by several projection. Consider (19a). (19a) is represented as in (19b), where the NP node dominating *this man* is dominated both by the VP node dominating *met* and the VP node dominating *saw*.

(19) a. John met and Sue saw this man.

b.



We will call a multiply dominated node a **'joining node'**. Joining nodes are base-generated, but subject to certain well-formedness conditions, in particular they have to be rightmost in a phrase marker in English.

Given these basics of the conception of three-dimensional phrase markers, we will now show how it can be extended to allow for implicit coordination in the constructions (1-5).

5. Implicit coordination

Let us consider again (1), repeated here as (20):

(20) John bought and Mary sold a total of ten cars.

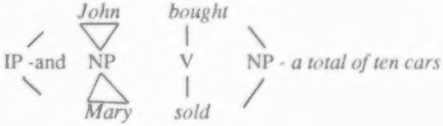
What we what to achieve is that *John* and *Mary* and *bought* and *sold* are implicitly coordinated. This notion of implicit coordination can be straightforwardly represented within the three-dimensional phrase marker approach. As with explicit coordination, the idea that *John* and *Mary* in (20) are implicitly coordinated would simply mean that they are dominated by one and the same splitting NP node. The only difference between explicit and implicit coordination would be that in the first case, but not in the second one, the splitting node also dominates an overt coordinator. Thus we can give the following definitions of explicit and implicit coordination:

(21) a. Constituents C_1,... ,C_n are explicitly coordinated iff C_1,... ,Cn are dominated by the same node X which also dominates a coordinator
b. Constituents C_1, ...,C_n are implicitly coordinated iff C_1, ... , C_n are dominated by the same node X which does not dominate a coordinator.

A further assumption we have to make is that implicit coordination is semantically evaluated by group formation like explicit phrasal conjunction; thus, for instance, the implicit coordination of *John* and *Mary* in (20) is evaluated as the group consisting of John and Mary.

The syntactic structure of (20) now looks in a simplified notation as follows:

(22)



The V node dominating *bought* and *sold* in (22)is not only a splitting node, but also a joining node: it is dominated both by the VP node that is a sister of the NP node dominating *Mary* and the VP node that is a sister of the NP node dominating *John*. Thus, the V node can appropriately be called a **'splitting/joining node'**.

The possibility of splitting/joining nodes requires an extension of Muadz' theory: joining nodes should not only be allowed in Right Node Raising contexts (where the node has to be rightmost in the phrase marker), but also in those cases in which the node is a splitting node not dominating a coordinator. For reasons of space, we will not go into how this extension should be formally implemented. But in any case we will assume that splitting/joining nodes are base-generated. Furthermore, they are subject to certain well-formedness conditions. For instance, splitting/joining nodes not dominating a coordinator should be able to occur in a phrase marker only if they are dominated by a node dominating a coordinator. This is stated in (23).

(23) A joining/splitting node that does not dominate a coordinator must be dominated by a node dominating an overt coordinator.

(23) might actually have a derived status and follow from conditions on the interprettion of a three-dimensional phrase markers.

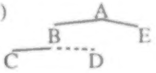
We have now given a syntactic representation of constructions such as (1-5) in which the elements taking collective antecedents can take antecedents of the syntactically appropriate sort, namely implicitly coordinated categories. Thus, in this respect, the structure of the examples in (1-5) is parallel to simple plural sentences. However, it is not yet clear how the semantic evaluation of these three-dimensional syntactic structures should proceed. We will come to the interpretation of the structures in the next section, where we will first propose a way to interpret three-dimensional trees compositionally in general.

6. The formal semantic account: Interpreting three-dimensional syntactic trees

6.1. The problem of the interpretation of three-dimensional syntactic trees

Three-dimensional syntactic trees raise a general conceptual and empirical issue about how they should be interpreted compositionally. Consider the simple tree in (25), where B is a splitting node.

(25)



There are in principle two ways, or two 'directions', in which (25) could be interpreted. First, C and D, that is all expansions of the splitting node B, are first evaluated as a unit and then the resulting semantic value is combined with the interpretation of E. Second, first C and E are interpreted as a unit and simultaneously D and E, and then the semantic values of CE and of DE are combined. In the first case, the interpretation of (25) proceeds in a 'local crossplanar' way; in the second interpretation, first the individual planes are evaluated and then the results are semantically combined.

Recall from section 4.1. that Muadz had intended only the second strategy of interpretation as the way in which three-dimensional trees are evaluated. The case he had in mind was primarily 'respectively' sentences, which were interpreted as the conjunction of several propositions corresponding to the individual planes, rather than as a single proposition about group objects. Let us again consider the example (16) repeated here as (26).

(26) John and Mary improved himself and herself (respectively).

In order to get the intended interpretation, the syntactic basis for the interpretation of a (simple) three-dimensional tree can be conceived in the following way. Every tree T is assigned a set of planes such that each expansion of a splitting node in T is contained in such a plane. Furthermore, a plane assignment is associated with a set of one or more occurrences of a coordinator. The notion of a plane assignment is given in (27):

(27) <u>The Notion of a Plane Assignment (first version)</u>
Let T be a three-dimensional phrase marker , A a set of expressions, B a set of phrase markers, then <A, B> is a **plane assignment** of T (<A, B> ∈ PA(T)) iff (i) - (iii) hold:
(i) all elements in A are occurrences of the same coordinator J,

(ii) all elements T' of B are two-dimensional subtrees of T,

(iii) for each expansion X of a splitting node Y of T, X is part of some T' $\in$ B.

Thus for (26) we have the following plane assignment:

(28) $<\{and_1, and_2\}, \{$*John improved himself, Mary improved herself*$\}> \in PA(T)$

The semantic interpretation of a three-dimensional phrase marker is based to such a plane assignment. We can give the following rule for the interpretation of a plane assignment - assuming for the sake of simplicity that coordinators denote functions applying to the set of the meanings of the conjuncts.

(29) <u>The Evaluation of a Plane Assignment</u>

If $<A, B> \in PA(T)$, then $[T] = [a](\{[T'] | T' \in B\})$ for some $a \in A$.

There are two kinds of cases where the second interpretation of a tree such as (25) as formalized here is not adequate - at least not with the notion of a plane as defined by Muadz. First, in this interpretation coordinators would always get maximal scope, that is, a scope which extends over the entire sentence. This is certainly not correct. Consider (30).

(30) a. John invented the rumor that Sue and Bill won the race.

b. John and Mary believe that Sue and Bill (respectively) won the race.

Maximal scope of *and* is impossible for (30a); that is, (30a) excludes a reading in which John invented two distinct noncontradictory rumors, one with the content that Sue won the race and another one with the content that Bill won the race. Similarly, the 'respectively' reading is hardly available for (30b).

A natural way to account for the limited scope of coordinators is to modify the notion of plane assignment. A plane need not be a two-dimensional subtree extending over the entire tree, but may be only a subtree of such a maximal two-dimensional subtree. I will call the three-dimensional subtree that corresponds to the scope of the coordinator, the **'domain'** of the coordinator. Thus the domain of the second occurrence of *and* in (30b) presumably is the three-dimensional subtree whose root is the embedded IP node. This requires the following modfication of the notion of plane:

(31) <u>The Notion of a Plane Assignment (revised version)</u>

A plane of a three-dimensional tree with respect to a coordinator J is a two-dimensional subtree that is obtained by selecting one of the expansions of each splitting node in the domain of D.

Another case for which the second strategy of interpretation does not work are phrasal conjunctions that are interpreted by group formation. For instance, (32) cannot be interpreted as a conjunction of the interpretation of *John met* and *Mary met*.

(32) John and Mary met.

Again, a way to solve this problem is by modifying the notion of plane. In order to get the right interpretation of (32), one should not construe maximal planes, that is, planes rooted in the IP node, but rather planes much smaller than that, namely planes that are rooted in the NP node. One of these planes will be the tree whose only terminal node is *John*, another one will be the tree whose only terminal node is *Mary*. We get the following plane assignment for (33).

(33) <{*and*}, {*John, Mary*}>

In order to interpret (32) with respect to this plane assignment, *and* will be evaluated by group formation rather than by Boolean conjunction. For (32), we can say that the domain of *and* is the three-dimensional subtree rooted in the NP node.

In order to account for multiple phrasal conjunctions in a sentence that are interpreted by group formation (*John and Mary embraced and laughed simultaneously*), the interpretation of a three-dimensional phrase marker must now be based on a set of plane assignments, rather than a single plane assignment.

The new possibilities for plane assignments raise several questions. First, when does one have to build 'small planes' and when 'big planes'? Second, is it possible that a sentence is interpreted simultaneously with respect to small planes and with respect to big planes? In the next section, we will answer the first question partially and give a positive answer to the second question. We will argue that sentences with implicit coordination require two simultaneous partial interpretations with respect to a set of assignments of small planes and a set of assignments of big planes.

Let us conclude this section by specifying formal semantic rules for the interpretation of phrasal conjunction in general.

Consider (34).

(34) John and Mary sang and played.

(34) allows for a variety of readings. These readings include the following four situations.

1. John sang and Mary played.
2. John played and Mary sang.
3. John sang and played and Mary sang and played.
4. John sang and Mary sang and played.

We will give rules for the interpretation of (34) based on a set of 'small plane assignments' which account for all four situations. The relevant set of plane assignments to (34) consists of (35a) and (35b).

(35) a. <{*and*}, {*John, Mary*}>
b. <{and}, {*sang, played*}>

For referential NPs, the required semantic rule is given in (36), where 'sum' is an operator mapping a set of entities into its sum (cf. Link 1983 and others).

(36) Let X_1 and X_2 be referential NPs, then
$[\{\mathit{and}\}, \{X_1, X_2\}] = \mathrm{sum}(\{[X_1], [X_2]\})$

Thus the plane assignment of (34) given in (35a) will be evaluated as the group consisting of John and Mary.

We will adopt the Davidsonian view on verb meanings according to which verbs taking n arguments denote (n+1)-place relations between events and n arguments. Thus *sing* and *play* denote two-place relations between events and agents. For the evaluation of two-place predicates in general, we assume the following semantic rule:

(37) Let Y_1 and Y_2 be two-place predicates, then
$[\{\mathit{and}\}, \{Y_1, Y_2\}] = \{<e, x> \mid \exists e'x'e''x''(Y_1(e', x') \& Y_2(e'', x'') \& e = \mathrm{sum}(\{e', e''\}) \& x = \mathrm{sum}(\{x', x''\})\}$

Thus, we have for an event e and an entity x, [*sing and play*](e, x) iff e consist of two parts e' and e" and x consists of two parts x' and x" such that e' is a playing by x' or x" (or both) and e" a singing by x' or x" (or both) and both x' and x" are the agents of either e' or e". The reader can easily check that all four situations given above are captured by these rules when applied to the two plane assignments given in (35).

Let us now come back to the sentences with implicit coordination and show how they can be semantically interpreted on the basis of the notions and rules given in this section.

6.2. The interpretation of syntactic structures with implicit coordination

The basic idea for the interpretation of sentences with implicit coordination is that they involve two partial interpretations, one where our initial example (20) is equivalent to (38a) and one where it is equivalent to (38b).

(38) a. John and Mary sold and bought a total of ten cars.
b. John sold and Mary bought some of the cars.

These two partial interpretations come about by interpreting (20) on the basis of two distinct plane assignments, one where (20) is assigned small planes and a second one where it is assigned big planes. The assignment of small planes is, of course, based on the implicit coordination of *John* and *Mary* and of *sold* and *bought*. Since there are no overt coordinators, this plane assignment will contain the empty set rather than a set of coordinator occurrences. The assignment of small planes to (20) is given in (39).

(39) The set of assignments of small planes to (20)
{<{ }, {*John, Mary*}>, <{ }, {*sold, bought*}>}

We will assume that when the first element of a plane assignment is the empty set, the same rules (36) and (37) apply that apply when the first element contains an occurrence of the coordinator *and*.

There are various ways to conceive of a partial interpretation of a sentence. The way we will do it in this paper (which is motivated primarily by simplicity and perspicuity) is to conceive it as a relation between events and participants that is formulated within first order logic. Thus the partial interpretation of (20) on the basis of the assignment of small planes will be the relation between events and objects given in (40).

(40) λey[sold and bought(e, [<{ }, {*John, Mary*}>], y) & cars(y) & Ae'y'(sold and bought(e', [<{ }, {*John, Mary*}>], y') & cars(y') --> card(y') ≤ 10))]

(40) is the relation that holds between an event e and an object y iff e is a selling-and-buying of y by John and Mary and y a group of cars and any selling-and buying event of cars y' by John and Mary is such that y' has at most ten members. The second conjunct in (40) should represent the semantic effect of *a total of*. (The adequacy of this is not so much at stake here.) (40) clearly can be construed in a compositional way; but in the present context it is not necessary to elaborate this.

(40) leaves open whether John did the selling and Mary the buying or conversely. Recall that the rule of predicate conjunction given in (37) is entirely vague in this respect. However, this information is obtained by the second partial interpretation of (20), namely the interpretation of (20) on the basis of 'big planes'.

The set of assignments of big planes to (20) is given in (41).

(41) The set of assignments of big planes to (20)
{<{*and*}, {*John bought a total of ten cars, Mary sold a total of ten cars*}>}

At first sight, the interpretation of the plane assignment in (41) seems to give the wrong results. According to (41), (20) seems to imply that John bought a total of ten cars and Mary sold a total of ten cars.

However, we will propose that by a general principle of the interpretation of planes, *a total of ten* can be disregarded in the evaluation of the plane assignment in (41). This principle says that (at least certain) elements in a plane need not be semantically evaluated if they are already semantically evaluated with respect to another plane assignment. More generally, the principle says that an element when possible has to be evaluated only once (with respect to one of its meaningful syntactic functions). The principle is stated in (42).

(42) The Principle of the Single Evaluation of Syntactic Elements.
An element has to be semantically evaluated only once (with respect to one of its meaningful syntactic functions).

Thus, since *a total of* in (20) has already been evaluated in the interpretation of the assignment of small planes, it can be disregarded in the evaluation of the assignment of big planes. We will assume that instead the entire NP *a total of ten cars* is interpreted as a free variable in the evaluation of the big plane assignment. This variable will be bound by the lambda-operator which defines the meaning of the plane as a relation between events and objects.

The meanings of the big planes of (20) can also be conceived as relations between events and participants. Thus, one of the planes expresses the relation in (43)a., the other one the relation in (43)b.

(43) a. $\lambda ey[\mathrm{bought}(e, [\mathit{John}], y)]$
b. $\lambda ey[\mathrm{sold}(e, [\mathit{Mary}], y)]$

The assignment of big planes then is evaluated by applying the operation for predicate conjunction given earlier, namely (37), to the two relations expressed by the two planes. This yields the relation in (44).

(44) $\lambda ye[e = \mathrm{sum}(\{e', e''\})\ \&\ y = \mathrm{sum}(\{y', y''\})\ \&\ \mathrm{bought}(e', [\mathit{John}], y')\ \&\ \mathrm{sold}(e'', [\mathit{Mary}], y'')]$

(44) is the relation that holds between events e and objects y iff e is the sum of two events e' and e" and y is the sum of two objects y' and y" such that e' is a buying of y' by John and e" a selling of y" by Mary.

The full meaning of (20) can now be obtained by conjoining the two partial interpretations (40) and (44) and applying existential closure to the event and the object variable. The result is given in (45):

(45) $\exists ey(e = \mathrm{sum}(\{e', e''\})\ \&\ y = \mathrm{sum}(\{y', y''\})\ \&\ \mathrm{bought}(e', [\mathit{John}], y')\ \&\ \mathrm{sold}(e'', [\mathit{Mary}], y''))$

There are a number of questions that still have to be answered. First of all, for the interpretation of (20) apparently both sets of plane assignments are required, rather than optional. The assignments of small planes certainly are required in order to provide an appropriate basis for the interpretation of *a total of*. Otherwise, *a total of* would not receive an interpretation at all and - one way of putting it - the sentence would constitute a violation of the Principle of Full Interpretation. But how should the assignment of big planes be necessitated? This plane assignment can be considered a consequence of the same principle: it provides the (only) basis for an interpretation of the overt coordinator *and*. Without this plane assignment *and* would be semantically vacuous in (20).

7. Deriving syntactic peculiarities of implicit coordination constructions

Constructions with implicit coordination have a number of syntactic particuliarities that follow straightforwardly from the present account - given certain very general principles about how to establish meaningful syntactic relations in three-dimensional syntactic trees. I will first describe the characteristic syntactic properties of the construction, before giving an explanation within the three-dimensional phrase marker approach.

7.1. The observations

1. the restriction to coordinate structures

One of the properties of the construction was already mentioned at the very beginning of this paper, namely the restriction to coordination. Old and new examples are given in (46).

(46) a. * A *man* saw a *woman who had danced together*.
b. * John met a *man* with a *dog who were quite similar*.
c. * Mary *sang* because John *played simultaneously / together / independently*.

2. the anaphoric element must belong to all conjuncts

Another very general constraint is that the element that takes the split antecedent must belong to all conjuncts. Thus (47) with the meaning 'John and Mary talked and wrote independently about this book' is bad because *independently* only belongs to the first conjunct, not to the second one.

(47) *John* talked *independently* and *Mary* wrote about this book.

3. the Coordinate Structure Constraint/ATB principle

Another peculiarity of the construction is that it obeys parallel conditions to the Coordinate Structure Constraint (CSC) and the Across-the-Board (ATB) Principle. The CSC disallows the extraction of a phrase from a conjunct of a coordinate structure, as in (48a), whereas the ATB principle suspends the CSC just in case the phrase has been extracted from each of the conjuncts of the coordinate structure, as in (48b).

(48) a. * Who did John see t and Mary come?
b. Who did John see t and Mary meet t?

The constructions in which an element takes a collective antecedent composed of parts of conjuncts pattern in exactly parallel fashion. That, is, if one of the conjuncts of a coordinate structure provides a part of the antecedent, then all of the conjuncts must do so. This is seen in (49), where a requirement parallel to the CSC is violated.

(49) a. * John met a woman, Mary met a man and Bill remained alone who have had an affair.
b. * John was upset, Mary was angry and it was raining on two days each.

4. The satisfaction of syntactic conditions on antecedent-anaphor relationships in each conjunct

A final characteristic property of the constructions in (1-5) is that any syntactic conditions on the relevant antecedent-anaphor relationship have to be satisfied in each conjunct, namely with respect to the phrase in the conjunct that forms a part of the antecedent. We will illustrate this requirement with binominal *each* and *themselves* in picture NPs. Both of these anaphors when occurring in an object NP must take an antecedent in the same minimal finite clause:

(50) a. **The women* said that Bill painted ten pictures *each*.
b. **The women* said Bill sold pictures of *themselves*.

This constraint must be satisfied in each conjunct if the antecedent is composed of parts of conjuncts. Thus, (51a) and (51b) are bad because the constraint is satisfied only in the first, not in the second conjunct.

(51) a. **John* saw and *Mary* said Bill painted ten pictures *each*.
b. * *John* sold and *Mary* said Bill sold pictures of *themselves*.

None of these four syntactic peculiarities falls out naturally in a purely semantic approach to the phenomenon such as the one Hoeksema (1986) takes. However, they are all straightforward consequences of the three-dimensional phrase marker approach advocated here given certain general and independently motivated conditions on syntactic relations in three-dimensional phrase markers.

7.2. Explaining the syntactic peculiarities

1: In the present account, the restriction of the construction to coordination follows simply from the definition of implicit coordination as multidominance. Implicit coordination requires that the phrases that are coordinated belong to distinct planes, which is possible only in a coordinate structure.

2: This constraint follows from a very general and plausible condition on how meaningful syntactic relations are established in three-dimensional syntactic trees. The condition requires that the items standing in such a relation belong to the same planes and hence one of the items (such as *independently* in (47) which belongs to only the first plane) may not belong to fewer planes than the other one (in (47) the set of phrases {*John, Mary*}, which belongs to both planes). If we call nodes and sets of co-dominated nodes **'syntactic units'**, the principle can be stated as in (52).

(52) Condition on Syntactic Units Standing in a Syntactic Relation in a Three-Dimensional Syntactic Tree
Two syntactic units X and Y can stand in a meaningful syntactic relation in a tree T only if X and Y belong to the same planes assigned to T.

3: The correlate of the CSC and ATB principle can be derived from the Principle of Full Interpretation (FI) when it is to apply to individual planes. Applied to the present case, FI implies that an element X requiring an antecedent has to take an antecedent in each plane that X belongs to. Note that FI has been adduced in the same way by both Goodall (1987) and Muadz (1991) to derive the CSC and the ATB principle as conditions on extraction.

4: This constraint can be made to follow from another general and plausible condition on how meaningful syntactic relations are established in three-dimensional trees. This principle says that a meaningful syntactic relation is holds between two syntactic units in a three-dimensional tree only if the relation is established in the ordinary way among the units or parts of the units in individual planes.

(53) Condition on Establishing Syntactic Relations among Syntactic Units in a Three-Dimensional Syntactic Tree
A meaningful syntactic relation R holds between syntactic units X and Y in a three-dimensional syntactic tree only if for any plane that X and Y belong to, R holds between an X' and a Y', where X' is a part of X or X itself and Y' is a part of Y or Y itself.

Clearly, in (53) X' must be X itself just in case X is a shared node (and similarly for Y').

In order to facilitate readability, the conditions (52) and (53) are stated in a rather informal way. Clearly this does not exclude the possibility of a precise formulation.

Constructions with implicit coordination also exhibit a number of semantic peculiarities. In the next section, we will discuss some of them and show how they follow or can easily be made to follow from the account of the interpretation of implicit coordination constructions given earlier.

8. Deriving semantic peculiarities of implicit coordination constructions

There are two characteristic semantic properties of implicit coordination constructions we will discuss, first the semantic behavior of what we will call simple plural arguments and second a distinction between arguments and adjuncts with respect to simple plurals.

8.1. The semantic behavior of simple plural arguments

The discussion of implicit coordination constructions has centered on the example (20) which contained the expression *a total of*. The main problem was to explain how (20) could have the reading in which John sold, let's say, five cars and Mary bought another five cars. Let us call such a reading of a plural NP the **'split reading'**. The availability of a split reading for *a total of ten cars* in (20) has been explained on the basis of the fact that *a total of ten* can take implicitly coordinated antecedents and hence can be disregarded in the evaluation of (20) with respect to the clausal coordination.

An important question is whether plural NPs not modified by *a total of* allow or disallow a split reading. Let us call such NPs, that is, NPs like *ten cars*, *the ten cars*, *the cars* or *which cars*, **'simple plural NPs'**. The answer to the question is that simple plural NPs generally disallow the split reading in constructions allowing for implicit coordination:

(54) a.These two women John married and Bill proposed to.
b. Which two women did John marry and Bill propose to.

(54)a. and b. do not have a reading in which John married one of the women and Bill proposed to the other woman. But both sentences allow for the implicit coordination of *John* and *Bill* and of *married* and *proposed to*.

The following explanation of the absence of the split reading of simple plural arguments can be given within the present approach. *A total of ten* in (20) enters a relation to an antecedent, the implicitly coordinated phrases *John* and *Mary* and *bought* and *sold*. However, these antecedents themselves do not require the relation; without *a total of* the sentence is perfectly interpretable. Simple plural NPs such as *these two women* in (54a) do not enter a relation to an antecedent. They only enter the relation of argumenthood to a verb. Crucially, the relation of argumenthood is required by the verb itself. Moreover, the relation of argumenthood is required both by the verbs in the big planes (that is, by *married* in the first plane and by *proposed to* in the second plane in 54a) and by the implicitly coordinated verbs (that is, by the implicit coordination of *married* and *proposed to* in 54a). Therefore, a simple plural NP has to be an argument both in the two big planes and with respect to the implicitly coordinated verbs. Thus, the partial interpretations of (54a) on the basis of the two plane assignments have to literally represent the following two propositions. (55a) corresponds to the assignments of small planes and (55b) to the assignment of big planes.

(55) a. John and Bill married and proposed to these two women.
b. John married these two women and Bill proposed to these two women.

Clearly (55b) is incompatible with a split reading.

For the explanation of the absence of the split reading, we have relied on the fact that other elements in the sentence (namely the verbs) require a syntactic relation to the plural argument NP. This predicts that adjuncts with plural NPs should behave differently. They should allow for the split reading. In the next subsection, we will see that this prediction is in fact borne out.

8.2. A difference between arguments and adjuncts with respect to the split reading

Plural NPs in adjuncts such as *in these two rooms* in (56) behave differently from plural NPs as verbal arguments in that they allow for the split reading:

(56) a. In these two rooms, John was born and Mary died.
b. I can't remember in which two rooms John was born and Mary died.

(56a) has two readings. First, it has the absurd reading in which John was born in the two rooms and Mary died in the two rooms. But then it also has the reading in which John was born in one of the rooms and Mary died in the other one, that is, the split reading.

The difference between arguments and adjuncts with respect to the split reading also shows up in NP coordinations that involve implicit coordination. This is seen in the contrast between (57a) and (57b).

(57) a. the husband and the fiancee of these two women
b. the man and the woman with the two black dogs

(57a), which contains a plural argument, does not allow for the split reading in which the two women have monogamous relationships. But the split reading is available for (57b), which contains a PP adjunct. (57b) can refer to the man who has one of the two dogs and the woman who has the other dog.

The difference between simple plurals in adjuncts and in arguments, as observed so far, follows immediately from the line of explanation used in the previous section: adjuncts are not required by any other element in the sentence. For this reason and by principle (42), they can be disregarded in the evaluation of a sentence with respect to a given set of plane assignments, provided they are evaluated with respect to some other set of plane assignments.

Thus, *in these two rooms* in (56a) can be disregarded in the interpretation with respect to the assignment of big planes, given that *in these two rooms* is evaluated in the interpretation of (56a) with respect to the assignment of small planes. In this case, we get the split reading of *these two rooms*. The other, absurd reading of (56a) is obtained when *in these two rooms* is evaluated with respect to big planes .

In this section, we have observed two semantic peculiarities of constructions that allow for implicit coordination, namely the unavailability of the split reading of simple plurals in arguments and the availability of the split readings of simple plural NPs in adjuncts. The difference between adjuncts and arguments has been explained on the basis of two general principles. First, elements may be semantically evaluated with respect to one of their syntactic functions just once in multiple simultaneous interpretations of a sentence. Second, an element that has a syntactic function that is required by other elements in the sentence has to always be evaluated with respect to this function. When the second principle applies, clearly the first principle cannot apply. This is the case when simple plurals are arguments.

10. Summary

There are three aspects that distinguish the treatment of the constructions with implicit coordination given in this paper. First, the treatment was based on a rather novel type of syntactic structure. The syntactic structures that were employed consist of three-dimensional phrase markers and involve a new construction type of implicit coordination. Second, given these syntactic structures, the interpretation of elements taking collective antecedents such as *a total of*, binominal *each*, relational adjectives etc. require only independenly established semantic rules which apply in the usual way. Third, the meanings of the sentences involving implicit coordination require a new type of interpretation, a simultaneous partial interpretation of the sentence with respect to at least two different plane assignments. These partial interpretations have to be combined to yield the full meaning of the sentence.

Acknowledgments

Some versions of this paper were presented at the University of Illinois, Urbana, the University of Pennsylvania, Philadelphia, and the University of Amsterdam. I would like to thank the audiences for helpful criticism. For discussions I would like to thank in particular Noam Chomsky, Howard Lasnik and David Pesetsky.

Notes

[1] Carlson (1987) argues that the antecedent of relational adjectives such as *same* and *different* is always an event. Thus given Davidsonian event semantics, the syntactic antecedent would always be a verb. This view is in a more formal way pursued in Moltmann (to appear). However, there are also cases where relational adjectives clearly take objects as antecedents, for instance in (5b), where NPs are coordinated. In this paper, we will not commit ourselves to the view that relational adjectives always take events as antecedents, not even when there is a potential event antecedent as in (2).

[2] The view that the semantic operation of group formation is restricted to the category plural and *and* is not universally maintained. In particular , in applications of Discourse Representation Theory to plural anaphora, group formation is assumed to also apply at the level of discourse referents (see van Eijck 1983, Kamp/Reyle, forthcoming). However, then group formation arguably is not a semantic operation in the strict sense, but rather an operation of disourse semantics.

References

Abbott, B. (1976): 'Right Node Raising as a Tests of Constituenthood'. Linguistic Inquiry 7.

Carlson, G. (1987): 'Same and Different: Some Consequences for Syntax and Semantics'. Linguistics and Philosophy 10.

van Eijck, J. (1983): 'Discourse Representation Theory and Plurality'. In A.G.B. ter Meulen (ed.): Studies in Model-theoretic Semantics. Foris, Dordrecht.

Gazdar, G. / G. K. Pullum / I. A. Sag / T. Wasow (1982): 'Coordination and Transformational Grammar'. Linguistic Inquiry 13.

Goodall, G. (1985): Parallel Structures in Syntax. Cambridge University Press, Cambridge.

Hoeksema, J. (1986): 'An Account of Relative Clauses with Split Antecedents'. In M. Dalrymple et al. (eds.): Proceedings of WCCFL 5. Stanford Linguistic Student Association, Stanford University, Stanford.

Jackendoff, R. (1977): Semantic Interpretation in Generative Grammar. MIT Press, Cambridge (Mass.).

Kamp, H. (1981): 'A Theory of Truth and Semantic Representation'. In J. Groenendijk et al. (eds.): Formal Methods in the Study of Language. Mathematical Centre, Amsterdam.

Kamp, H. / U. Reyle (forthcoming): From Discourse to Logic. Ms. University of Stuttgart.

Lasersohn, P. (1990): 'Group Action and Spatio-Temporal Proximity'. Linguistics and Philosophy 13.

Link (1983): 'The Logical Analysis of Plurals and Mass Terms: A Lattice-Theoretical Approach'. In R. Baeuerle et al. (eds.): Meaning, Use and the Interpretations of Language. de Gruyter, Berlin.

------ (1984): 'Hydras. On the Logic of Relative Clause Constuctions with Multiple Heads'. In F. Landman et al. (eds.): Varieties of Fromal Semantics. Foris, Dordrecht.

Moltmann, F. (to appear): '*Same / Different* and *Each Other*. Towards a Semantic Analysis.' Linguistics and Philosophy.

---------------- (forthcoming): Coordination and Comparatives. PhD dissertation, MIT Cambridge (Mass).

Muadz, H. (1991): A Planar Theory of Coordination. PhD dissertation, University of Arizona, Tucson (Arizona).

Perlmutter, D. / J. Ross (1970): 'Relative Clauses with Split Antecedents'. Linguistic Inquiry 1.

Safir, K. /T. Stowell (1988): 'Binominal *Each*'. J. Blevins et al. (eds.): Proceedings of NELS 18, Graduate Linguistic Student Association, University of Massachusetts, Amherst.

Massachusetts Institute of Technology
Department of Linguistics
20E-D213
Cambridge, MA 02139
USA
moltmann@athena.mit.edu

Two Kinds of Indexicality[1]

Geoffrey Nunberg
Xerox Palo Alto Research Center and Stanford University

At a first pass, indexical expressions are usually defined by ostension of the prototypical members of the class: e.g., as "words like *I*, *now*, and *here*." I suppose that's appropriate. But a well-known problem with ostensive definitions is that they leave implicit the essential properties of the class. In the recent literature on indexicality we can discern two distinct understandings of what makes these expressions exceptional, one growing out of linguistic work on quantification and anaphora, the other out of philosophical accounts of reference. And although these writers have generally assumed that they are all talking about the same thing, I want to argue here that what people describe as "indexicality" really involves two different phenomena.

Indexicality and anaphora

Recent theories of anaphora have generally made it an explicit goal to produce unified accounts of the various uses of pronouns and analogous devices.[2] The object here is to assimilate the deictic uses of pronouns, as in an utterance like (1), to their uses as discourse anaphors and bound variables, as in (2) and (3). (I'll use the symbol "☞" to indicate a demonstrative use of an expression):

(1) Get a load of ☞ her!
(2) A woman entered. She sat down.
(3) Every woman forgot her coat.

To date, discussions of this question have been largely programmatic — much more attention has been given to the anaphoric uses of pronouns than to their deictic uses.[3] But the general strategy is clear: we will want to think of the context of utterance on the model of the other contexts that can control anaphors and related expressions; that is, the discourse model and quantifiers.

One ancillary but important consequence of taking this point of view is that it leads us to define the class of indexicals in a broad way. As a various people have noted, the patterns of use exhibited by the pronouns in (1)-(3) are also found with temporal and locative items like tenses and the word *there*. And Mitchell (1986) and

---

[1] Thanks to Cleo Condoravdi, Mary Dalrymple, Mark Gawron, François Recanati, and Annie Zaenen for comments and suggestions.

[2] Cf., eg.,Kamp (1984:6): "The analysis of pronominal anaphora I shall sketch is informed by the conviction that the mechanisms which govern deictic and anaphoric occurrences of pronouns are basically the same."

[3] One exception is Heim (ms), who argues that the theoretical apparatus developed within DRT accounts of anaphora can be invoked to explain some of the apparent semantic paradoxes that arise within direct-reference accounts of demonstratives.

Partee (1989) have noted that we see the same effects with a wide range of open-class items like *local, enemy, foreign, away*, and so on, which behave as if they contained implicit pronoun-like variables. So a sentence like (4) can have three readings, depending on whether the occurrence of *local* is controlled by the utterance context, the subject, or the quantifier — that is, whether the athlete is local relative to the location of the speaker, the *New York Times*, or each of the reporters in question:

(4) *The New York Times* had every reporter cover a local athlete.

Analogously, the phrase *fifty miles away* in (5) (from Partee) can be construed relative to either the utterance context or the context established by the quantifier:[4]

(5) Every man who stole a car abandoned it fifty miles away.

Of course not all pronouns and analogous expressions display the same range of behavior as the third-person pronouns in (1)-(3). On the one hand, there are some expressions that can only be controlled by the context of utterance — what we can think of as "dedicated indexicals." Partee gives (6) and (7) as a way of illustrating this point with *I*:

(6) ??Every speaker$_i$ has trouble stopping when I$_i$ should.
(7) ??Every person in line$_i$ said that I$_i$ had been waiting for more than an hour.

That is, *I* can't range over different speakers here. And (8) shows the impossibility of using *tomorrow* as a bound variable:

(8) Whenever Jane and I get into a fight I know she'll call to apologize tomorrow (ok the next day).

---

[4] As Partee observes, one important motivation for trying to assimilate these expressions to the uses of pronouns is that both types seem to be subject to the same kinds of syntactic constraints. For example, she points out that the relative acceptability of (i) and (ii) reflects a difference in c-control:

(i) Every untenured professor$_i$ in the state received a letter from the leader of a local$_i$ union.
(ii) ?The leader of a local$_i$ union sent a letter to every untenured professor$_i$ in the state.

And Jacobson (this volume) makes the same point with regard to the i-within-i condition, as demonstrated by (iii)-(vi):

(iii) the woman$_i$ who married her$_i$ childhood friend
(iv) *the wife$_i$ of her$_i$ childhood friend
(v) The man$_i$ who owns a local$_i$ bar can get a drink any time.
(vi) *The owner$_i$ of a local$_i$ bar can get a drink any time.

The adjectives *current* and *present* show the same distinction. Both words can be used to pick out an interval surrounding the time of utterance, but only *current* can pick out an interval surrounding a reference time supplied by an explicit temporal operator:

(9) In 1978, the present/current president was a Democrat.

With *present*, (9) says unambiguously that George Bush was a Democrat in 1978; with *current* it allows both that reading and a reading where it says that Jimmy Carter was a Democrat.

At the other end of the scale, there are some anaphoric expressions that can't be controlled by the context of utterance. The best-known instances are third-person reflexives and the various constructions that Sag and Hankamer (1984) have described as "surface anaphors": VP ellipsis, sluicing and slifting, and so forth. But there are also lexical anaphors that are subject to this restriction, for example *the former* and *the latter*. These expressions are used discourse-anaphorically in (10) to mean roughly "the first-mentioned" and "the last-mentioned":

(10) Flynn came up to bat followed by Jimmy Blake; the former got a hit and the latter bunted safely.

But if you are at a baseball game and somebody asks you who's already batted in the inning, you could not respond with (11):

(11) A: Who's been up in this inning?
B: ??The former was Flynn and the latter was Blake.

On the basis of observations like these, we must assume, with Partee, that the lexical entries for anaphors and anaphor-like expressions should include a specification of the particular kinds of contexts they can be controlled by. Thus *I* and *present* will be lexically marked as permitting only control by the utterance context; *the former* and *himself* will be marked as permitting control only by discourse anaphors and quantifiers, and *he* and *current* will be marked as permitting control by any kind of context (or what is equivalent, these words will be unmarked with regard to this feature). These control properties are summarized in Table 1:

Table 1: Summary of control properties

	utterance context	discourse or quantifier context
I, tomorrow, here	YES	NO
he, local	YES	YES
the former, himself	NO	YES

On this approach, then, to say that an expression is indexical is simply to say that its interpretation is either an element of the utterance context (e.g., the time of speaking) or something that stands in a specified relation to such an element (e.g., the calendar day that follows the time of speaking). Indexicality is sometimes a property of expression types (as with the word *present*) and sometimes a property of expression uses (as with the uses of the word *current* that are controlled by the context of utterance).

Direct reference accounts

In what follows, I'll use "indexical" in this relatively broad sense, to refer to expressions or uses of expressions whose interpretation is determined relative to elements of the utterance context.[5] In the direct-reference theories developed by Kaplan, Perry, and others, however, the term has generally been used in a more restricted way. On these accounts, what makes indexicals exceptional is not simply that their linguistic meanings make reference to recurrent features of the context of utterance (or that indexicals are token-reflexive or however this is put), but that these meanings don't figure as part of what is said by the utterances containing occurrences of the expressions. Thus the meanings of words like *I*, *now*, or *here* are functions from contexts (or from tokens or occurrences of expressions) to persons, times, or places; and once this function is evaluated for a particular utterance we throw away the meaning and take the thing it picks out as being the propositional component that corresponds to the expression. That is, indexical utterances express singular propositions. This is what distinguishes indexicals like *I* from the descriptions (eg. "the speaker of the utterance") that paraphrase their linguistic meanings; hence the difference in truth-value between utterances like (12) and (13):

---

[5] I say "relatively broad" because terms like *indexical* and *deictic* are sometimes used in a very general way to include any expression whose interpretation is sensitive to features of the context of utterance, including the beliefs or interests of conversational participants. Speaking in this way, one could say for example that the English genitive is indexical, in the sense that we require contextual information to determine whether a phrase like *John's book* refers to the book that John owns, that John has written, and so forth. Of course this is a much broader understanding of the term than it has generally had in the recent philosophical literature (though it is worth noting that Peirce sometimes used the word in a similarly loose way; at one point he suggests that *red* is an indexical since its meaning can only be learned by ostension).

(12) I am necessarily a speaker.
(13) The speaker of this utterance is necessarily a speaker.

For our purposes, it is important to bear in mind that the direct-reference story really involves two claims about indexical reference. The first is that the linguistic meaning of an indexical or the demonstration associated with a demonstrative doesn't figure as part of the content of the utterance. The second is that what an indexical contributes to the utterance content is the very individual that satisfies the linguistic meaning, or the very thing picked out by a demonstration. These claims are in principle distinct. The fact that an occurrence of an expression doesn't contribute the property associated with its linguistic meaning doesn't mean that it can't contribute some other property, after all. And in fact I'll argue in a moment that this sometimes happens. So for the moment I want to characterize the interpretive peculiarities of indexicals just in terms of the first part of the claim, that their meanings aren't part of the utterance content. I'll describe this claim by saying that expressions like *I* and *that* are indicative, rather than descriptive. And I will describe such indexicals as deictics.[6]

Two kinds of indexicality

At this point, then, we will want to compare these two understandings of indexicality, and to ask whether they pick out the same class of expressions or uses of expressions. As we are using the terms here, that is, are all indexicals deictics? This question hasn't been much looked at, for several reasons. On the one hand, as I noted, linguists who have worked on anaphora and related topics haven't examined the indexical uses of pronouns in any detail. On the other hand, the philosophers who have developed the direct-reference approach have tended to concentrate on a handful of dedicated indexicals like *I* and *this*, and haven't been particularly concerned with the linguistic issues that originally motivated the attempts to assimilate the various uses of pronouns. (For example, Kaplan suggests at a couple of points that the demonstrative and anaphoric uses of a form like *he* should be regarded as homonyms, a claim that most linguists would find unpalatable — though I will wind up arguing that it contains a kernel of truth.)[7]

In fact I want to argue here that indexicality involves two distinct phenomena, associated with different classes of expressions and expressions-uses. The first is deixis, which is associated with a particular class of indexicals — for example, words like *I* and *tomorrow* and demonstratives like *this*. As I suggested, deictics are inevitably indicative. The second phenomenon is what we can think of as "contextuality," where an expression permits control by the context of utterance, but where its meaning remains part of the utterance content.[8]

---

[6] This usage isn't standard, of course. For the most part, the words *indexical* and *deictic* are distinguished by provenance; philosophers tend to use the former, linguists the latter. Beyond that, writers have used both words in a variety of ways, though to my knowledge, no one has used them contrastively before.

[7] "These words [personal pronouns] have uses different from those in which I am interested (or perhaps, depending on how you individuate words, we should say that they have homonyms in which I am not interested)." (Kaplan 1989:489) "...the fact that demonstrative and anaphoric pronouns are homonyms..." (1989:589)

I'll try to make this distinction more precise in a moment, but let me first give some empirical evidence for it. One way to tell deictics from contextuals is to look at how the expressions interact scopally with other operators. It's an important piece of evidence for direct-reference theories that the meanings of words like *I* don't seem to participate in such interactions, since their meanings aren't part of the utterance content. So an utterance of (15) doesn't have the ambiguity associated with an utterance of (14):

(14) The speaker of this sentence could have been a contender.
(15) I could have been a contender.

In (15) that is, we can only evaluate the meaning of *I* relative to the actual context of utterance, and once we determine a value it's fixed for all possible circumstances. But note that contextuals like *local* do show such interactions. For example, suppose we're on a trip driving South across Texas, and we've been stopping every evening for Mexican food. At a certain point I say (16) (I'll use the subscript "c" to indicate a use of an expression that's controlled by the utterance context)

(16) The local_c salsa is getting spicier.

On the most likely reading, (16) means "In each place we stop, the salsa is spicier than it was at the last place." That is, we take *local* as falling within the scope of the progressive. In this regard *local* contrasts with the phrase *around here* in (17):

(17) The salsa around here is getting spicier.

The only thing (17) can mean is that the salsa at the very place we've stopped is getting spicier — presumably we've been stopping over for a while. That is, the progressive can't take wide scope over the phrase *around here*.[9]

---

[8] Clark (1983) uses the term "contextual" in a broader way, to mean, roughly, expressions whose reference depends on the circumstances of utterance. As such, Clark's contextuals include not only the subclass of indexical expressions I am interested in here, such as *local*, but denominal verbs, noun-noun compounds, and so on.

[9] Examples like (i) and (ii) make the same point with regard to a modal operator:

(i) If I'd taken the reassignment, there'd have been a good local_c Chinese restaurant that we could go to tonight.
(ii) If I'd taken the reassignment, there'd have been a good Chinese restaurant around here that we could go to tonight.

We can make the same point by considering examples of VP ellipsis. Consider the exchange in (18), as spoken over the telephone between people in Palo Alto and Los Angeles:

(18) A (in Palo Alto): My doctor lives a mile away$_c$/a mile from here.
B (In Los Angeles): Mine does too.

With *a mile away*, B's response can mean that his doctor lives in Los Angeles. That is, the content of *a mile away* can be abstracted and re-evaluated relative to B's place of utterance. But with *a mile from here*, B's utterance can only mean that his doctor lives in Palo Alto, too; the reference of *here* is bound to the location of the context of utterance. And (19) shows that we get the same distinction with *current* but not *present*:

(19) Bush had been complaining about the current$_c$ (??present) interest rates, just as Hoover did.

That is, the content of *current* in the antecedent can be re-evaluated in the target clause relative to Hoover's situation, but the content of *present* cannot be.

Deferred reference

I'll come back to these examples shortly, but now I want to turn to another difference between deictics and contextuals, which involves the phenomenon of deferred reference. Here I have to give a bit of background. I said a moment ago that I wanted to take from the direct-reference account of indexicals as only the claim that deictics are indicative — that is, that their meanings do not figure as part of the utterance content — rather than the further claim that indexical utterances express singular propositions, in which the interpretation that corresponds to a use of an indexical is the very thing its linguistic meaning picks out of the context My reason for this reservation is that standard accounts of deictic expressions have tended to ignore their use in the processes of deferred reference or deferred ostension. The crucial observation here is that the contextual element picked out by the linguistic meaning of a deictic or by a demonstration often serves as a pointer to the interpretation of the expression, rather than actually being the interpretation. For example, you can point at a newspaper copy and say:

(20) Murdoch bought ☞ that for $50 million.

In (i), we can evaluate *local* with regard to other possible circumstances, that is, relative to the reference point that would have been established by my utterance if the conditional were satisfied. Whereas in (ii) the reference of *around here* is permanently fixed relative to the actual point of utterance.

And in this case you are most likely referring to the company that publishes the newspaper, rather than to the copy itself. Or you can point at the couch in John's new office and say (21):

(21) ☞ That has grown more imposing with each of John's promotions.

The referent of the demonstratives in (21) is a kind-level individual each of whose stages is the unique couch that John has had in his office at any one time. Or take (22), where someone points at a picture of the Pope and says:

(22) ☞ He is usually an Italian.

Here again, the referent is the kind-level individual each of whose stages is a person who is the Pope at a certain interval.

Now we have to tell a fairly complicated story to explain just what kinds of correspondences can figure in determining the reference of deictics in cases like these. But one point that we should bear in mind is that the interpretations of deictics used in this way needn't necessarily be of the same type as the contextual element that the indexical picks out — in particular, they needn't be individuals. A deictic can contribute a property, as well, provided the property corresponds in some salient way to the demonstratum or the element picked out by the linguistic meaning of the expression. For example, you can point at a sports car and say (23):

(23) ☞ That is what I've always wanted.

An utterance of (23) needn't entail that the speaker has always wanted the very car he is pointing at; more likely it means that he has always wanted to own some car that has the properties that the demonstratum exemplifies. By the same token, suppose a condemned prisoner utters (24):

(24) I am traditionally allowed to order whatever I like for my last meal.

It's unlikely that the pronoun here denotes the prisoner himself, since there is not likely to be a tradition that prescribes what that particular person can order for his last meal. Rather, this occurrence of *I* has roughly the same interpretation as the description in a sentence like (25), which contributes the property of being a condemned prisoner:

(25) The (a) condemned prisoner is traditionally allowed to order whatever he likes for his last meal.

Or consider example (26), as spoken by George Bush:

(26) The Founders invested me with sole responsibility for appointing Supreme Court justices.

Once again, we interpret the pronoun here as contributing the property of being president of the United States, rather than the individual George Bush. Of course the indexical is still indicative, since the property contributed by the indexical isn't the property associated with its linguistic meaning. That is, (26) doesn't mean the same as (27):

(27) The Founders invested the speaker of this sentence with sole responsibility for appointing Supreme Court justices.

But at the same time the utterance expresses a general proposition.

Now examples like these are reasonably familiar, but there is a tendency to think of them as involving a kind of derived or secondary reference that arises through a process of conversational implicature. In that case we would say that the indexicals and demonstratives in these examples literally refer to the elements they pick out of the immediate context, and that these elements are then taken as standing in a kind of metonymy for their ultimate referents. But this line is hard to defend, for several reasons. In the first place, note that in deferred reference the inflectional features of the pronoun or demonstrative — number, animacy, gender, and so forth — are determined by the properties of the ultimate referent, not the contextual element or the demonstratum. For example if you want to identify a class of plates by pointing at a single demonstratum you use the plural *those*, as in (28):

(28) ☞ Those are not in stock.

And by the same token, when you point at a book to identify its author you use *he* or *she*, not *that*. This observation has a further wrinkle in Romance languages, where the gender of a demonstrative is determined by the grammatical gender of the name of the basic-level category that the demonstratum belongs to. If an Italian furrier wants to point at a mink (*il visone*, m.) to identify the furs of the animal, he must use the feminine demonstrative *quella* (pl. *quelle*), since the word for "fur" (*la pelliccia*) is feminine:

(29) Quelle si vendono bene. "Those are selling well."

So it's hard to see how we could assign these utterances a literal meaning where the indexical actually refers to the physical demonstratum; how can *those* denote a single plate, or the feminine plural *quelle* denote a single mink?

An even more immediate reason for rejecting a purely Gricean analysis of these uses is that deferred reference is not possible when a name or referentially used description is substituted for the indexical. For example, suppose the condemned prisoner is called Darnay, and that he also happens to be the man who is loved by Lucie Manette. Still, (30) can't have an interpretation where the subject contributes the property of being a condemned prisoner:

(30) Darnay (the who is loved by Lucie Manette) is traditionally allowed to order whatever he likes for his last meal.

By the same token, (26) isn't paraphrased by (31):

(31) The Founders invested George Bush with sole responsibility for appointing Supreme Court justices.

Both these examples can only have *de re* readings. But if the deferred readings in examples like (25) and (26) are derived pragmatically from a literal reading where the indexical refers directly to its contextual index, then this is puzzling. Whatever process generates the conversational implicature when the deictic is used should also be available to generate it when a name is used in its place. In either case we would be mapping from a singular proposition to a related general proposition.[10]

So the deferred use of deictics has to have an explicitly semantic license. And in fact the phenomenon is intimately connected to the indicativeness of these items. Direct-reference theorists are right to say that the function of the meanings of deictics and of demonstrations is to get us to a contextual element that provides the interpretation of an occurrence of the expression. But this element doesn't actually have to be the interpretation. Rather it can be a pointer to the interpretation; that is, an index in the Peircean sense of the term. In this sense the contextual element picked out by a deictic is functionally analogous to the content of a description, rather than to its denotation.[11]

---

[10] It might be argued that the difference between the readings here arises from a conversational implicature occasioned by the use of the proper name — to identify somebody by name, the story would go, is to imply that his personal identity is somehow particularly relevant to the application of the property being predicated. I don't think this argument can be maintained, for two reasons. First, deferred reference is not available with referentially used descriptions, either, even though these function basically as demonstratives do; that is, they pick out something in terms of properties that are simply contextually salient. So suppose we see John Paul II standing in the corner with a martini in his hand. I can say (i) but not (ii):

(i) He is usually an Italian.
(ii) ??The man with the martini is usually an Italian.

But it would be hard to argue that the choice of the description *the man with the martini* has any particular relevance to the predication here; I've simply used that description because it is a useful way of picking the referent out of the context. What's more, as we'll see below, deferred reference is not available with the anaphoric uses of pronouns:

(iii) ??A man came in wearing a red miter and speaking in a Polish accent. He was usually an Italian.

It is hard to see what kind of Gricean explanation could be offered here for the failure of deferred reference. Certainly the maxim of manner can't be invoked, since the mode of presentation of the referent is the same here as in (i); i.e., both use the pronoun *he*.

Deferred reference and contextuals

For these reasons, we expect that deferred reference will be possible only with those indexicals that are indicative; i.e., with deictics. And this gives us a second criterion for sorting out deictics and contextuals. For example, suppose you are about to go to the south of France, and you want to know where to look for mushrooms. I take you to the bank of a stream in California and say (32):

(32) The best mushrooms are found around here (in this area).

With either *around here* or *in this area*, (32) has a reading where it means something like "the best mushrooms are usually found near the bank of a stream." But this deferred reading isn't available with contextuals like *locally* or *nearby*, as in (33):

(33) The best mushrooms are found locally$_c$ (nearby$_c$).

If *locally* or *nearby* is given an indexical reading in (33) (that is, if the relevant location is fixed by the utterance context), then the utterance can only mean that the best mushrooms are found in the area surrounding the very place of speaking. Examples (34)-(35) make the same point about temporal indexicals.

(34) The crowds in the university bookstore have usually abated by a week from now (by tomorrow).

(35) ??The crowds in the university bookstore have usually abated soon$_c$ (in a while$_c$).

As uttered on the first day of the quarter, (34) most likely means, "The crowds have usually abated a week after the first day of the quarter"; that is, *now* has a deferred reading, where it contributes a property exemplified by the actual time of speaking. But (35) has no such reading. *Soon* can only be interpreted as referring to a particular time shortly after the moment of speaking, and the reason (35) is odd is that this interpretation is inconsistent with the meaning of *usually*.

Deictics and contextuals

Table 2 summarizes the properties that distinguish deictics from contextuals:

---

[11] For an extended discussion of this point, see Nunberg (ms).

Table 2: Differences between deictics and contextuals

	deferred interpretations	scopal interactions
contextuals	NO	YES
deictics	YES	NO

At this point the obvious question is whether there is some independent semantic property that enables us to predict which expressions fall into which categories. At a first pass, we might expect that deictics correspond to the class of dedicated indexicals; that is, expressions that are lexically restricted to indexical use. But this hypothesis is both too weak and too strong. It is too weak because we find deferred reference with third-person pronouns, which are the archetypal examples of expressions that can be controlled by all types of contexts. We already noted this in connection with example (22), where somebody points at a picture of the Pope and says *He is usually an Italian.* Or suppose we're at a party and see Ralph in friendly conversation with Clovis, apparently unaware that Clovis has been carrying on a clandestine affair with Ralph's wife. I point at Ralph and say:

(36) ☞ He is always the last one to know.

meaning something like, "The husband is always the last one to know." That is, the pronoun here contributes a property. So if we take the availability of deferred interpretations as criterial for the identification of deictics, and if we further assume that demonstrative and anaphoric uses of third-person pronouns do not involve homonymous forms, then we have to assume that deixis isn't restricted to dedicated indexicals.

But there are some other observations that complicate this picture. As it turns out, the identification of deictic and indexical uses of third-person pronouns is not so straightforward as people generally assume. A crucial feature of the uses of the pronouns in cases like (36) is that they are accompanied by explicit demonstrations. But these pronouns also have nondemonstrative indexical uses, where they refer to a person who is simply salient in a particular background. For example, say we're walking through Versailles and you say:

(37) Gee, he certainly spared no expense.

The obvious reference here is Louis XIV. But Louis XIV isn't demonstrated here, either by the speaker or the context. He's simply salient in the consciousness of the conversational participants. And when pronouns are used in this way — i.e., when they are simple contextuals — they can't have deferred readings. For example, take the situation of the triangle involving Ralph, Clovis, and Ralph's wife. But now, instead of a situation where I point at Ralph, suppose we happen to be driving past Ralph's house late at night and we see Clovis leaving. I can easily say (38), where the pronoun refers to Ralph himself.

(38) He must be away.

But I can't say (39), using the pronoun to refer to the role Ralph exemplifies:

(39) He is always the last one to know.

That is, the use of *he* in (39) is indexical but not deictic, and hence no deferred interpretation is available. So in cases like (36) the deictic interpretation of the pronoun doesn't follow from its lexical meaning. Rather, it's the result of a kind of operator introduced by the demonstration.

I'll have more to say about this operator in a bit, but first let me mention some of the consequences of this observation. For one thing, if the deictic feature of pronouns is introduced by an explicit demonstration, then we won't expect pronouns to have deferred interpretations when they are used as discourse anaphors or bound variables. And this seems to be right. For example, suppose we go to the opera and hear a mezzo singing a part that is usually sung by a coloratura. I can point at the singer and say:

(40) ☞ She is usually a coloratura.

where the pronoun refers to the role the singer is performing. But the pronoun in (41) can't refer to a role:

(41) ??Every mezzo has difficulty when she [= the role sung by the singer] is usually a coloratura.

Analogously, the anaphorically used pronoun in (42) can't have an interpretation where it contributes the property of being president of the U.S., and the pronoun in (43) can't refer to the Pope as a kind-level individual:

(42) ??George Bush spoke next. He was invested by the Founders with the authority to appoint justices to the Supreme Court.
(43) ??The prelate who is addressing the U.N. is Polish, but he is usually Italian.

On this analysis, we would predict that contextual pronouns — i.e., nondeictic indexical pronouns — can participate in scopal interactions with other operators, the way the word *local* does in an example like (16), *The local$_c$ salsa is getting spicier*. That is, their contexts of evaluation should be able to fall within the scope of other operators (in Kaplan's terms, these operators should should be "monsters"). So say A is showing B around a well-appointed campus building that was donated by the wealthy alumnus Croesus O'Shea. They have the following exchange.

(44) A: The trustees certainly got a lot of money out of him.
B: They always do.

B's response here may be interpreted strictly (i.e., "The trustees always get a lot of money out of Croesus O'Shea"), but it can also have a sloppy reading, where it means roughly, "The trustees always get a lot of money out of the donors of buildings." In this case we have to be able to treat the relation between the pronoun and the context of utterance of the antecedent clause as available for abstraction and reinterpretation in the target.[12] (Note that this reading is not available if the pronoun is used deicticly — for example, if (44) is uttered while demonstrating a statue of the donor. In that case the target clause can have only a strict reading.) Examples like this raise interesting problems for semantic theories of ellipsis, but I won't pursue this here. The point I want to make is simply that while these pronouns are obviously indexical, they aren't directly referential; their interpretations aren't fixed for all possible circumstances.

With pronouns like *he*, then, we want to say that deictic interpretations are introduced by a demonstration associated with a use of the expression, rather than by a lexical feature associated with the lexical entry for the item, or even just with its indexical uses. At the same time, though, this operator can't be introduced freely with all contextual expressions or even with all pronouns. This is clear when we contrast the pronoun *it* with the demonstrative *that*. *It* can be used indexically to refer to some object that is salient in the context, as when you hand me a suitcase and I say:

(45) Gosh, it's heavy.

But *it* can't be used as a demonstrative. For example, you can't point at one of the glasses of wine sitting before you at the table and say:

(46) ??Now ☞ *it's* what I call a good burgundy.

---

[12] We can make the same point with examples involving the use of *they* to refer to some vague institutional or social agency that is salient in the context. For example, suppose a Stanford professor and a Berkeley professor are talking about university budget cuts, and they have the exchange in (i):

(i) Stanford professor: I'm afraid they're going to start start cutting funds for RA's.
Berkeley professor: I'm not.

The Berkeley professor's response has a reading where she isn't disagreeing with what the Stanford professor is saying; that is, where she is talking about different university authorities. Once again, then, the interpretation of the pronoun in the antecedent has to be abstracted and reinterpreted relative to the target.

And for just this reason, the pronoun *it* can't generally have a deferred reading. Say you're flipping through the stations on the television and a Giants game appears on the screen. I can say:

(47) Don't switch, it's my favorite team.

But now say that rather than the team itself, we see the face of Giants first baseman Will Clark, dressed in a coat and tie. In this case I can only get to the Giants via deferred reference, but an utterance like (47) with *it* won't permit this process. Instead I have to say (48), using the demonstrative *that*:

(48) Don't switch, that's my favorite team.[13]

(I should note that with forms like *this* and *that* we don't always require an explicit demonstration to get a deictic interpretation, since the deixis is built into the meaning element that distinguishes proximal and distal forms.) These examples show that *it* has to be lexically specified as not permitting deictic use, or in what amounts to more-or-less the same thing, that *he* must be lexically marked as permitting such use.[14] And this is a lexical feature that is independent of control properties of these pronouns, both of which can be either indexicals or anaphors. This is why I said earlier that there was a kernel of truth in Kaplan's contention that the demonstrative and bound-variable uses of *he* were homonyms, except that the distinction should really be drawn between the deictic and nondeictic uses. I'm not saying that these are different forms, but the deictic use of *he* requires an explicit lexical license.

With third-person pronouns and other contextual expressions that have both indexical and nonindexical uses, then, the availability of a deictic interpretation requires an independent lexical specification. But what about the dedicated indexicals? Can we at least say that these are always deictic? It's true most of them are — *I*, *tomorrow*, and so on. But there are some exceptions, which show that this connection too is contingent. For example, the postposition *ago* can only be controlled by the utterance context, as demonstrated by (49):

---

[13] Or suppose we drive past a car that has just hit a tree, in circumstances where the accident manifestly has both our attention. I can say (i) but not (ii), where the intended reference is to an accident-type:

(i) Gosh, it must have happened just a second ago.
(ii) ??It (ok that) has happened a number of times on this stretch of highway.

[14] Note that the plural *they* permits deictic use when it refers to animates, but not when it refers to inanimates (i.e., when it is the plural of *it*). Examples involving deferred reference make this clear. You can point at a record and say "They are playing a concert next week." But a salesperson in a record shop can't point at a picture of a singer and say, "They are defective," to refer to a shipment of records by that singer, though "Those are defective" works here.

(49) ??Every writer who visited Paris in the 1930s wished he'd been there ten years ago (ok: before).

But *ago* doesn't license deferred use, as (50) and (51) show:

(50) When I was a kid, they began to decorate the trees a week before now (before today, etc.).

(51) ??When I was a kid, they began to decorate the trees a week ago.

In (50), *a week before now* is roughly equivalent to a description like "a week before December 15," or whatever date the sentence is uttered on — that is, the indexical contributes a property that is exemplified by the time of utterance. But in (51), *ago* can't have this reading, which entails that *ago* is not a deictic. So we have to conclude that even where deixis is a provided by lexical feature rather than a demonstration, it has to be specified independently of the restrictions on control that limit an item like *ago* to indexical use.

It follows that the lexicon has to make provision for three types of indexical expressions: those that are invariably deictic, like *I*; those that cannot be deictic, like *it*; and those that permit but don't require deictic use, like *he*. This is summarized in Table 3:

Table 3: Lexical specification of deixis

I, tomorrow	+DEICTIC
it, local, ago	-DEICTIC
he	±DEICTIC

In the end, then, the two approaches to indexicality that we began with yield largely disjoint definitions of the phenomenon. I don't think we should find this surprising. No one has ever offered a theoretical reason why there should be an absolute correlation between expressions which have indexical meanings (i.e., which are token-reflexive, controlled by the utterance context, or whatever) and expressions with the particular interpretive properties associated with direct reference (i.e., indicativeness). This was always an unexplained empirical assumption, and it simply turns out to be false.[15]

---

[15] Note that on this account the interpretive properties of deictics are different from those of proper names, though the two are conflated on most direct-reference accounts. I would argue that unlike indexicals, proper names are indicative in virtue of the kinds of linguistic rules that determine their use; i.e., to be a proper name is to directly denote an individual. But proper names are not like deictics in that their conventional denotations can't serve as Peircean indices of their interpretations; that is, they don't permit deferred reference.

Deixis and Interpretation

Let me conclude by saying a bit more about the interpretations of deictics. On the account I'm offering here, deixis involves an operator that is a lot like Kaplan's Dthat; it takes contexts, tokens, or whatever into elements of the context. The difference is that here we want to make explicit semantic provision here for deferred reference. One way of accommodating this is to have the semantics constrained by a context-sensitive "deference function," which composes with the deixis operator to produce an interpretation. Sag (1981) proposed something along these lines in an effort to formalize some of these observations about deferred reference. But Sag made this function part of the content of the expression, whereas I prefer to think of it as a kind of constraint on the relation between the context and the content. Take for example the case of pointing at a newspaper to identify its publisher. Let δ be the demonstratum, and let F_c be the deference function that is relevant in the context; here, the function from newspaper copies to their publishers. Then we can represent the interpretation of a sentence like *Murdoch bought that* as something like (52):

(52) Bought-for-\$50-millon (Murdoch, z), where $z = F_c(\delta)$

Now if deference functions were limited to functions that returned individuals, this wouldn't have any important effect on the direct-reference story, since these utterances would still express singular propositions. But we've seen that deictics can also have other kinds of interpretations. They can contribute kinds, properties, and so forth. And this raises the question of how these interpretations should be represented and what becomes of the direct-reference approach when we extend the account to cover these cases.

Note also that the account of deixis I've offered here doesn't explain why only indexicals should permit deictic readings — why shouldn't deixis (and hence deferred reference) be available with the uses of names and referentially used descriptions as well? In fact there are examples that suggest this is possible. Say we're watching a televised Senate debate; I point at Dan Quayle, the presiding officer, and say:

(i) Dan Quayle over there (the blond featherhead over there) might have been a Democrat.

And (i) has a reading where it means roughly "The presiding officer of the Senate might have been a Democrat"; that is, the proper name contributes a property. This example needs more discussion than I can give it here, but I should make two points. First, there are a number of reasons for believing that the deferred interpretation here, unlike that with deictics like *I*, is derived via a kind of secondary or reference, and needn't be provided for semantically. Second, it is notable that the interpretation here is limited to properties that Dan Quayle saliently exemplifies in the context. Yhe subject of (i) can't have the interpretation, "the chair of the council on competitiveness," say, even though Dan Quayle is known ot have that property as well. In effect, the interpretation is limited to properties that can be physically demonstrated. I think this observation is relevant to explaining the general restriction of deixis to indexicals, but I will not pursue this here.

Interestingly, I think the basic insight survives intact. For example, suppose we take an example based on (26). You point at George Bush and you say:

(53) ☞ He was invested by the Founders with the authority to appoint Supreme Court Justices.

The pronoun here contributes something like the property of being the president. But we don't want to mention a particular property in the representation, since it's not clear whether the speaker would produce that very description, or if he even knows exactly what properties are relevant. What (53) says, rather, is something like, "Whoever has the relevant property that the demonstratum corresponds to was invested by the Founders with the authority to appoint Supreme Court Justices."

But it's important to note here that the interpretation in these cases is limited to properties that the demonstratum actually exemplifies. So you could not say (54) or (55) while demonstrating Michael Dukakis:

(54). ☞ He could have been invested by the Founders with the authority to appoint Supreme Court Justices..

(55) ☞ He could have been traditionally the titular head of his party.

That is, we can't evaluate the deference function relative to some other possible context in which Dukakis had been elected president. So while it's true that a utterance like (53) expresses a general proposition, there's still a sense in which the pronoun is "directly referential." We evaluate the deference function relative to the actual context, and once its value has been determined as a particular property, that property is fixed for all circumstances. Accordingly, we could represent the interpretation of the pronoun in (53) using a free property variable, as in (56); here again F_c represents a contextually determined deference function, but in this case one that takes individuals into properties:

(56) $\lambda P\ [\forall x\ [\Pi(x) \rightarrow Px]$, where $\Pi = F_c(\delta)$

As in example (52), then, the relation between the interpretation and the demonstratum is treated as a constraint that relates the context to utterance content.

The observations I've offered here raise a number of questions for theories of indexicality. For example, how exactly do demonstrations fit into this picture, and how can we assimilate the demonstrative uses of pronouns to the uses of indexicals like *I*? At the same time, we will want to know how to accommodate these observations within standard accounts of anaphor, such as DRT: do they entail that there are really two kinds of "discourse entities" by which indexical expressions can be controlled? I think the answer is yes, but I won't argue the point here. But the first step in answering these questions is to realize that "indexicality" is not in fact a homogeneous phenomenon.

References

CLARK, HERBERT H. 1983. Making sense of nonce sense. The Process of Language Understanding, ed. by G. B. Flores d'Arcais and R. J. Jarvella. New York: Wiley.

HEIM, IRENE. MS. Direct reference explained away.

KAMP, HANS. 1984. A theory of truth and semantic representation. Truth, Interpretation, and Information, ed. by J. A. G. Groenendijk, T. Janssen, and M. Stokhof. Dordrecht: Foris.

KAPLAN, DAVID. 1989. Demonstratives. Themes from Kaplan, ed. by Joseph Almog, John Perry, and Howard Wettstein. Oxford: Oxford University Press.

MITCHELL, JONATHAN E. 1986. The formal semantics of point of view. University of Massachusetts dissertation.

NUNBERG, GEOFFREY. MS. Indexicality and deixis. To appear in Linguistics and Philosophy.

PARTEE, BARBARA H. 1989. Binding implicit variables in quantified contexts. BLS 25.

SAG, IVAN AND JORGE HANKAMER. 1984. Towards a theory of anaphoric processing. Linguistics and Philosophy 7, 3.

SAG, IVAN. 1981. Formal semantics and extralinguistic context. Radical Pragmatics, ed. by P. Cole. New York: Academic Press.

Xerox PARC
3333 Coyote Hill Road
Palo Alto, CA 94304
nunberg@parc.xerox.com

The Semantics of Number in Arabic[*]

Almerindo E. Ojeda
University of California at Davis

1. Introduction

The Arabic category of Number presents a major challenge to the formal semanticist. In addition to a singular, a dual, and a plural, Arabic has a collective and a singulative as well as a multal and a paucal. In addition to this, Arabic has two categories which are perplexingly called "the plural of the plural" and "the dual of the plural". The purpose of the present paper is to use the semantics of individuation proposed in Ojeda (in press) to provide the complex number distinctions of Arabic with a precise interpretation. It will be seen that the proposals made in this paper agree rather well with the observations and intuitions of traditional grammarians, especially with the ones collected in the monumental *Arabic Grammar* of Mortimer Howell.

Let us begin by assuming without argument that we are given a set on which to base our semantics for Arabic Number. This set will be called *the universe of discourse*. It will also be called *E*. If the universe of discourse has any elements, they will be said to be *individuals* or, more properly, *the individuals of the universe of discourse*.

Let us turn now to kinds and their instances. Let us turn, that is, to objects like the one denoted by *the computer* in (1a) and to objects like the one denoted by *the computer* in (1b).

(1) a. Turing invented the computer.
b. Turing repaired the computer.

It has been argued in Carlson (1978), that both kinds and their instances are individuals of the universe of discourse. This means that any relation between kinds and their instances will be a relation between elements of the universe of discourse. Consider in particular *the relation of instantiation*. This is the relation which an individual bears to a kind just in case the individual is an instance of the kind. The object denoted by *the computer* in (1b) thus bears the relation of instantiation to the object denoted by *the computer* in (1a).

The relation of instantiation allows us to define a number of notions which will prove essential to our goals. It will allow us to say, for example, that two kinds *overlap* just in case they have a common instance. More formally, let us use '≤' to refer to the relation of instantiation. We define:

---

[*] I am indebted to Ali Alalou for his intuitions and for his patience in reviewing the data with me. I am also indebted to Donka Farkas, Steven Lapointe, and the anonymous SALT II readers for comments.

(2) For all $x, y \in E$: x *overlaps* y if and only if there exists some $z \in E$ such that $z \leq x$ and $z \leq y$.

The relation of instantiation will allow us further definitions. Let us say that a given set of individuals constitutes a kind (or, conversely, that a kind is constituted by a given set of individuals) just if two conditions hold. One is that all the individuals in the set are instances of the kind; the other is that every instance of the kind overlaps some element or other of the given set. More formally, let w, x, y, z be arbitrary elements of E. We define:

(3) For all $F \subseteq E$: F *constitutes a kind* x if and only if
    (i) $y \in F$ implies $y \leq x$.
    (ii) $z \leq x$ implies that there exists some $w \in F$ such that z overlaps w.

We may now state the central assumption on which this paper is based. It is that the universe of discourse must satisfy the following properties when taken in conjunction with the relation of instantiation.

(4) TRANSITIVITY: For all $x, y, z \in E$: $x \leq y$ and $y \leq z$ jointly imply that $x \leq z$.
    COMPLETENESS: For all $F \subseteq E$: If F is not empty, then there exists exactly one $x \in E$ which is a kind constituted by F.

More succinctly, the assumption is that, when taken together, the universe of discourse and the relation of instantiation form a *mereology*.[1] Since a mereology is structurally indistinguishable from the positive portion of a complete boolean algebra (cf. Tarski 1956b, 333n), our central assumption is a direct descendant of proposals made in Link (1983). The main difference between our views of the universe of discourse is that we have chosen to interpret the partial order of the said algebra as the relation of instantiation.

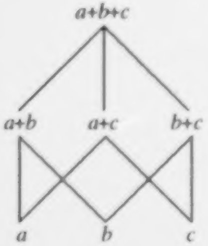
To illustrate our central assumption, we should first introduce some useful notation. Thus, if some set F constitutes a kind, then we shall feel free to use $\Sigma(F)$ to refer to that kind. Notice that the functional notation is appropriate here since subsets constitute at most one kind each. Moreover, if a finite set $\{a, b, c, \ldots, n\}$ constitutes a kind, then we may also choose to use $a+b+c+ \ldots +n$ to refer to that kind.

Let us now turn to (5). This is a diagram for a universe of discourse which forms a mereology when taken in conjunction with a relation of instantiation. The universe of discourse is the set $\{a, b, c, a+b, a+c, b+c, a+b+c\}$. The relation of instantiation is such that if *x* and *y* are two distinct individuals of the universe of discourse, then *x* is an instance of *y* just in case an upward path from *x* to *y* can be followed in (5).

---

[1] Mereologies were first defined by Stanislaw Lesniewski in the early part of this century as an alternative to set theory. The formulation adopted in this paper is due to Tarski (1956a). Mereologies have been used as theories of the relation between parts and wholes. We shall remain neutral as to whether this should be so. As to sets, they have been used above and will continue to be used throughout this paper. See Simons (1987) for a thorough discussion of mereologies.

(5)



To make the illustration more concrete, let us suppose that *a*, *b*, and *c* are computers. This means that *a+b+c* is computerkind —the kind constituted by the set of computers of the universe of discourse.[2] Let us moreover suppose that *a* and *b* are digital computers, that *a* and *c* are big computers and that *b* and *c* are powerful computers. It now follows that *a+b* is the kind constituted by the set of digital computers, that *a+c* is the kind constituted by the set of big computers, and that *b+c* is the kind constituted by the set of powerful computers.

Interestingly, it also follows that *a* is the kind constituted by *{a}*, the set of big digital computers, that *b* is the kind constituted by *{b}*, the set of powerful digital computers, and that *c* is the kind constituted by *{c}*, the set of big powerful computers. This means that *a, b, c* are literally *sui generis* individuals; they are kinds onto themselves. But all seven elements of our universe of discourse are by definition individuals. We may therefore want to distinguish *sui generis* individuals by calling them *proper individuals* (*of the universe of discourse*). But by completeness all seven elements of our universe of discourse are also kinds —even if some of them are kinds onto themselves. We may therefore want to invoke another distinction and set apart *a+b, a+c, b+c*, and *a+b+c* by calling them *proper kinds (of the universe of discourse)*.[3]

Natural languages are sensitive to the propriety of kinds and individuals. As seen in (1), verbs like *invent* select proper kinds, while verbs like *repair* select proper individuals. As shown by (6), similar distinctions are acknowledged by adjectives like *dead* and *extinct*.

(6) a. The dodo is extinct.

---

[2] We follow Quine (1969) in using the convenient morphological expedient of *-kind* suffixation.

[3] Technically, a proper individual can be defined as a kind which lacks *proper instances* —which is to say as a kind which lacks instances other than itself. Proper kinds can be defined as those elements of the universe of discourse which are not proper individuals.

b. The dodo is dead.

For indeed, if successful, *the dodo* in (6a) refers to the proper kind constituted by all the dodos in the universe of discourse while *the dodo* in (6b) refers to the proper individual which is also constituted by all the dodos in the universe of discourse. The distinction between "kinds" and "objects" widely made in the literature thus emerges in the present context as a distinction between proper kinds and proper individuals.

2. The Collective

The collective nouns of Arabic are basic lexical items which indicate either "a substance or material in the mass", or else "a collection of objects viewed as a totality without reference to the individual members" (Erwin 1963, 166). The Iraqi dialect of Arabic contains, for example, collectives like *bee∂* 'eggs (in general)', *xishab* 'wood', and *dijaaj* 'chicken (viewed as a kind of food) or chickens (as a species)'. Given the assumptions formulated in the preceding section, a proposal concerning the collective of Arabic can now be advanced. It will take the form of a constraint on the interpretation of collective nouns or, more accurately, on the interpretation of nonvacuous collective nouns.[4] The constraint reads as follows.

(7) Every collective noun denotes, if anything, a singleton subset of the universe of discourse.

To illustrate, let us suggest that *bee∂* denotes $\{e\}$, where e is eggkind, the kind constituted by the set of eggs in the universe of discourse. Along similar lines, *xishab* would denote $\{w\}$, where w is woodkind, the kind constituted by the set of portions of wood in the universe of discourse. As to *dijaaj*, the facts are more interesting. When it means 'chickens (as a species)', it will denote $\{c\}$, where c stands for chickenkind, the kind constituted by the set of chickens in the universe of discourse. But when it means 'chicken (viewed as a kind of food)', it will denote 'chicken-food-kind', the singleton which contains the kind constituted by the set of portions of chicken food. In fact, it may denote $\{m(c)\}$, where m is the function which assigns, to each individual, the mass which makes it up (cf. the materialization function of Link 1983).

The semantics of collectives we have just proposed seems to correspond closely to intuition. As we have seen, Erwin (1963, 166) takes collectives to denote "substances" or "collections of objects viewed as a totality". Along the same lines, Talmoudi (1980, 132) regards the collective as denoting either "a collective of things or animals regarded as a unit", or else "a mass or a volume", Wright (1933, 147) describes the collective as expressing "the genus or whole", and Abdel-Massih et al. (1979, 49) define the collective as a noun that designates "a class or mass of like things without counting the units that make up the mass"; it is "the mass wherein the individuality of the 'amassed' is effaced" Fleisch (1961, §65b). The collective, then, "denotes the species as a whole" (Harrell 1962, 78); it has "generic reference" (Holes 1990, 149).

---

[4] To ease exposition we will indulge in the terminological abuse of saying that a noun is vacuous (or that it fails to denote anything) if and only if it denotes the empty subset of the universe.

But it might be thought that collectives should simply denote kinds, not the singletons of kinds. This move seems unadvisable. If noncollective nouns are to denote sets, then we cannot assign all nouns a unified semantic type. Collectives would denote type-zero denotations (elements of the universe of discourse) while noncollectives would denote type-one denotations (subsets of the universe of discourse). What is more, this type branching in the nominal system would have a wide ranging rippling effect; it would force the systems of nominal specifiers and complements to branch accordingly in order to combine meaningfully with their heads.

To gauge the strength of (7) let us recall that collectives are nouns, and that nouns denote subsets of the universe of discourse. Now, any universe of discourse with *n* elements will of course have 2^n subsets. Of these, only *n* can be collective denotations (one for each element). Thus, the universe of discourse in (5) has $2^7 = 128$ different subsets. Only seven of them, however, can serve as the denotation of a collective. They are *{a}, {b}, {c}, {a+b}, {a+c}, {b+c}, {a+b+c}*. The set of possible denotations for a collective noun is thus drastically reduced by the constraint in (7).

3. The Singulative

Singulative nouns are lexical items which are derived from collectives and refer either to "a specific quantity of the substance", or else to "an individual member of the collection" denoted by the collective they derive from. Thus, in the Iraqi dialect of Arabic, the collective *beeð̣* 'eggs (in general)' corresponds to the singulative *beeð̣a* '(an) egg'; the collective *xishab* 'wood' corresponds to the singulative *xishba* 'piece of wood', and the collective *dijaaj* 'chicken (viewed as a kind of food) or chickens (as a species)' corresponds to the singulative *dijaaja* '(an individual) chicken' (Erwin 1963, 166).

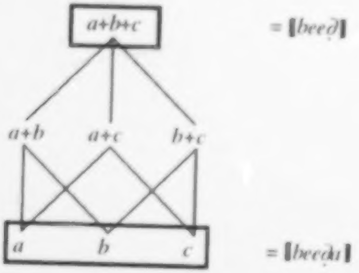
Along the same lines, Brockelmann (1960, §66b) pointed out that the singulative ending "is sometimes attached to a noun with general meaning in order to mark a singularity (*ein Einzelnes*)". According to Harrell (1962, 78), "to indicate one member of the general category referred to by the collective, a singular is formed by adding the feminine ending *-a*". For Cowell (1964, 297), "a singulative noun designates an individual unit or instance of what its underlying noun designates collectively or in general".[5]

---

[5] The term "singulative" is attributed to Zeuss (1853, 299), who used it to refer to the category of nouns which stood in opposition to the collective in Celtic. The singulative is called *ʔismu 'l-*

But what, exactly, should the singulative denote? In light of the foregoing, the answer might seem clear: a singulative should denote a set of proper individuals — indeed, the set of proper individuals which instantiate the kind denoted by its collective base. Thus, if the universe of discourse is as diagramed in (5), and if *a, b, c* were eggs rather than computers, then the denotation of the collective *beeḍ* 'eggs' and the singulative *beeḍa* '(an) egg' would be as follows.

(8)



But a problem for this analysis arises as soon as we leave count collectives like *beeḍ* 'eggs' and move onto mass collectives like *xishab* 'wood'. For, suppose that mass kinds are characterized by the fact that they can never be instantiated by proper individuals.[6] After all, mass nouns have been characterized as nouns which do not carry with them criteria for the individuation of their reference. If this is so, then singulatives like *xishba* 'piece of wood' would have to denote the empty set in every universe of discourse, and thus be illformed on semantic grounds. More generally, the singulatives of mass collectives would all be contradictory.

To avoid such an obviously incorrect prediction, let us suppose that we were to take a kind and split it into a set of nonoverlapping instances. We will say that this set is a *partition* of the kind in question. To be more precise, we will say that a subset of a universe of discourse counts as a partition if the subset meets two conditions. One is that no two elements of the subset overlap in the sense of (2). The other is that the subset constitutes the kind in question in the sense of (3). Let us suppose, for example, that all the wood in the universe of discourse is contained in a pile of logs. Clearly, the logs in the pile do not overlap, as they have no common parts. Moreover, these logs constitute wood in this universe. We may therefore say that the set containing these logs constitutes woodkind in the chosen universe.

As we see it, every singulative noun denotes a partition. To be more specific, a partition of the kind denoted by its corresponding collective. Thus *xishba* 'piece of wood' will denote a partition of woodkind —say the set of logs in the pile. We

---

waḥdati by traditional Arab grammarians and *nomen unitatis vel individualitatis* 'noun of unity or individuality' by their Western followers (cf. Greenberg 1977, 287f).

[6] See Ojeda (in press) for arguments that mass nouns denote kinds which are deprived of proper individuals.

are then able to interpret this singulative without assuming a set of individual instances of wood (thus renouncing to an attractive analysis of mass nouns). All we need is a set of mutually exclusive and jointly exhaustive instances of wood.

It should not escape the reader that if we have an individuation for a kind, then we also have a partition for the kind, as every set of proper individuals is a set of nonoverlapping instances (if two distinct instances overlap, then they have at least one instance other than themselves, namely their overlap). It is therefore consistent with our proposals to claim that *beeḍa* '(an) egg' denotes a set of proper individuals —that is to say an *individuation*. The proposal in terms of partitions is a generalization of the proposal in terms of individuations.

But it might be thought that the proposal is *too* general. Let k be a kind in our universe of discourse. Suppose there is some collective which denotes $\{k\}$. If k is a proper kind, then it will have more than one partition. In fact, it will probably have many, as the number of partitions of a kind grows exponentially with its number of individual instances. And if k lacks an individuation, then it will have uncountably many partitions.[7] It follows that kinds exhibit what might be called *a severe indeterminacy of partition*. The question thus arises as to whether all the partitions of a kind are potential denotations of a singulative. Does nominal semantics reflect the severe indeterminacy involved in the partition of a kind?

To fix intuitions, let (5) be our universe of discourse and let $a+b+c$ again be the kind of eggs contained therein. It can be shown that this kind has the five partitions listed in (9). Of these, (9e) is the only denotation for *beeḍa* '(an) egg' we have so far considered. May *beeḍa* denote (9a)-(9d) as well?

(9) a. $\{a+b+c\}$
    b. $\{a, b+c\}$
    c. $\{b, a+c\}$
    d. $\{c, a+b\}$
    e. $\{a, b, c\}$

As we see it, the question should be answered in the affirmative. Notice that each partition of a kind represents a different way of splitting a kind into subkinds. The question then becomes whether a singulative can refer to an arbitrary split of a kind into subkinds. But as far as I can see, it can. In any event, this would not be limited to Arabic. English may use a singular like *star* or *animal* to refer to kinds of stars and kinds of animals, as when we say that the asterisk is *a star* or that the dolphin is *a remarkable animal*. No individual stars or animals are referred to here. Notice that we may even say that Napoleon and Hitler faced *the same winter* when they tried to invade Russia.

---

[7] The number of partitions of a kind with n individual instances coincides with the number of partitions of a set of n elements —and hence with the nth term in the Bell sequence of numbers. See Gardner (1978) for a delightful piece on this versatile sequence.

That individuations are the singulative denotations which come most readily to mind is of little consequence —at least if we are concerned with semantic competence rather than with semantic performance. The relevant issue is whether partitions other than individuations are possible or not. The primacy of individuations over other partitions may then follow from other considerations —say the fact that reference to proper individuals occurs more often than reference to proper kinds.

Similar points can be made if we focus on partitions other than individuations. For, not all such partitions come equally readily to mind. Some partitions involve "natural kinds" and thus seem "more natural" than others. It might thus be thought that singulatives should only be able to denote "natural partitions". But naturalness is not something that semantics should decide. On the contrary, natural languages allow us to refer to all kinds —including the false, the unnatural, and the perverse. To make them undenotable is to demand too much of language and too little of other systems of knowledge and belief. Singulatives should be able to denote *all* partitions —at least in principle.

Let us return now to *xishba* 'piece of wood'. The move from individuations to partitions was originally motivated by this mass singulative. The same point can be made, however, with every other mass singulative. Instead of making the point thus, let us focus more closely on the gloss 'piece of wood' given by Erwin (1963, 166) for *xishba*. Notice that there are many ways of splitting wood into pieces. Indeed, given the view of mass reference adopted for this study, there will be uncountably many such ways. But all such partitions should be equally possible denotations for *xishba*. We must therefore be prepared to allow an uncountable infinity of partitions as potential denotations of a singulative!

But it might be objected that woodkind may be partitioned into instances other than pieces. Indeed, it seems clear that a piece of wood must be spatially continuous (no two logs in our pile, for example, should count as *one piece*). Kinds, on the other hand, need not be spatially continuous (oak, for example, is a kind of wood which is widely scattered throughout the world). It follows that there are ways to split wood into subkinds which cannot count as pieces of wood. Surely here, the objection would go, the proposed assignment of partitions to singulatives is too general.

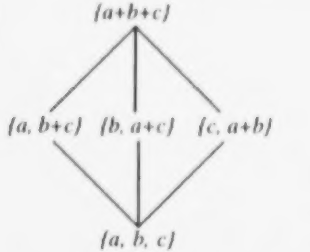
The point would have to be conceded —at least if we must gloss *xishba* as 'piece of wood'. But what if *xishba* could be glossed as 'instance of wood' instead? Unfortunately, the evidence for glossing it one way or the other is not easy to find, and must await further research. In any event, similar problems will be posed by all mass singulatives which are glossed in terms of highly nonarbitrary instances. Consider for example the collectives *burr* 'wheat' and *baqar* 'cattle' of Classical Arabic. Their singulatives are, respectively, *burrat* 'a grain of wheat' and *baqarat* 'a cow, bull, or ox' (cf. Howell 1900, 1057f). These singulatives denote partitions which are far from arbitrary; they denote rather salient partitions of a kind instead.

Or consider what has been traditionally called the 'singulative of specification' —the use of the singulative to refer to a dish or portion of any food, as in *orizzat* 'a dish of rice', *samakat* 'a dish of fish', *lahmat* 'a portion of meat', and *jubnat* 'a portion of cheese' (cf. Wright 1933, 147). Here too, the partition denoted by the singulative is highly nonarbitrary. Again, our proposals for the singulative are hardly strong enough to identify, in each case, the partition denoted by the singulative.

None of these examples is necessarily problematic for our proposals. First, it must be decided whether the glosses are indeed as nonarbitrary as usually given — whether the glosses should not instead be in terms of 'instances'. But even if the glosses are accurate, the case could still be made that the proposals should be allowed to stand: the proposals would then have to be complemented by principles, drawn from other systems of knowledge and belief, which would assign a higher "selectional probability" to a partition by grains in the case of*burrat*, by actual bovines in the case of *baqarat*, and by servings in the case of *orizzat*, *samakat*, and so on.

Let us turn now to issues of formulation. How exactly, should our proposal be casted? We begin to answer this question by observing that the partitions in (9) can be partially ordered in terms of coarseness. Thus, (9a) is the coarsest, (9e) is the finest, and (9b)-(9d) are somewhere in between (and in no particular order of coarseness with respect to each other). Diagrammatically, the situation is as shown in (10), where every upward path relates some partition to a coarser one.

(10)



But coarseness in (10) represents *genericity*. Thus, the top node of (10) represents the most generic partition of a+b+c, while the bottom node thereof represents its most specific partition. The partitions ordered in between are intermediate in genericity (and incomparable with each other in this respect).

Now, let us recall that *{a+b+c}* may serve as the denotation of the collective *beeḍ* 'eggs'. But as indicated in (9a), *{a+b+c}* is also a partition of *a+b+c*. This means that the singulative *beeḍa* '(an) egg' and the collective *beeḍ* 'eggs' are similar in that both denote partitions of a kind. *Beeḍa* and *beeḍ* differ, however, in that the former denotes a more refined partition than the latter.

As it turns out, the set of the partitions of *any* kind can be partially ordered in terms of genericity.[8] Collective denotations will always be the coarsest partitions of a kind, while singulative denotations will always be refinements thereof. The proposals of this section thus follow from (11), where a *refinement function* is simply an operation which refines a partition.

(11) Singulative suffixes denote refinement functions.

To see this, let us take (11) in conjunction with the fact, mentioned above, that a singulative is a noun which is derived from a collective by the addition of a singulative suffix. For if we do, then the simplest way to combine the denotations of a singulative suffix and a collective stem will be for the former to operate on the latter and produce the desired refinement of a generic partition. The interpretation of the count singulative *beeḍa* '(an) egg' may therefore proceed as indicated in (12). Here we assume a universe of discourse in which *a*, *b*, *c* are the only proper individuals which are eggs.

(12) $[\![\textit{bee\d{d}a}]\!] = [\![a]\!]([\![\textit{bee\d{d}}]\!]) = \{a, b, c\}$

In addition, the interpretation of the mass singulative *xishba* 'piece of wood', may proceed as indicated in (13), where we assume that *a*, *b*, …, *j* are ten logs which constitute woodkind.[9]

(13) $[\![\textit{xishba}]\!] = [\![a]\!]([\![\textit{xishab}]\!]) = \{a, b, c, d, e, f, g, h, i, j\}$

The singulative morpheme will thus be able to select *either* the units *or* the pieces which partition a kind. This double effect of the singulative has been recognized by Arabic grammarians. We have seen that Erwin (1963, 166) takes the singulatives of Iraqi Arabic to refer either to "a specific quantity of the substance", or else to "an individual member of the collection". Elsewhere (1963, 174), he takes them to refer either to "a single unit" or else to "a piece of the designated material". Along the same lines, Mitchell (1956, 94) describes the unit nouns of Cairene Arabic as referring to "one or a piece of a larger whole". As to Classical Arabic, Wright (1933, 147) observed that singulatives designate either "one individual out of a genus, or one part of a whole that consists of several similar parts".

The double effect of the singulative can be nicely illustrated by the ambiguous singulative *dijaaja*. For, when interpreted as a partition of a kind of bird, its denotation proceeds along the lines of (12), but when interpreted as a partition of a kind of food, its denotation parallels (13) instead. When taken in the latter sense, it constitutes an example of the "singulative of specification" mentioned above.

---

[8] In fact, the set of partitions of any kind forms a complete lattice when taken in conjunction with the relation of refinement (cf. Gratzer 1978, 192).

[9] Incidentally, refinement functions are defined only for partitions of a kind, and no partition of any kind can ever be empty (the definition of constitution prevents the empty set from constituting any kind in a universe of discourse which constitutes a mereology with the relation of instantiation). This means that meaningful singulatives must derive from nonvacuous collectives.

Finally, it will not have escaped the reader that the flexibility of our analysis of the singulative is predicated on the availability of a multiplicity of senses for the singulative suffix. It is indeed assumed that the singulative suffix may have as many senses as there are refinement functions (a more proper notation might thus assign different subindices to the singulative morphemes in (12) and (13) above). In any case, it is in the semantics of the singulative morpheme that nominal semantics reflects the severe indeterminacy in the partition of a kind we have alluded to above.

4. The Singular

In addition to the derivational opposition between the singulative and the collective, the nominal system of Arabic recognizes an inflectional contrast between the singular, the dual, and the plural, which we will now address. We will discuss the singular in this section and leave the dual and the plural for the next.

Following the pioneering work of Link (1983), a noun is usually said to be semantically singular if and only if it denotes a set of proper individuals of the universe of discourse. Yet, in light of facts mentioned in the preceding section concerning the ability of the English singular to refer to proper kinds, (14) seems a preferable alternative. Further evidence to this effect can be drawn from quantification over kinds, from the taxonomic interpretation of mass plurals, and from the semantics of definite generics.[10]

(14) A noun is semantically singular if and only if it denotes a pairwise disjoint subset of the universe of discourse.

As might be expected, a subset of the universe of discourse will be *pairwise disjoint* if and only if no two elements thereof overlap. And, since the universe of discourse is complete in the sense of (4), every pairwise disjoint subset of the universe will constitute a kind —at least if the subset is not empty.[11] This means that every pairwise disjoint subset of the universe will be a partition, and that the categories of the singulative and the singular do not contrast in meaning. But this is as desired; Arabic singulatives are universally regarded as singular.

Naturally, every set of proper individuals of the universe of discourse will be pairwise disjoint (proper individuals would otherwise have their overlap as instances other than themselves). But not every pairwise disjoint set will be a set of proper individuals of the universe (consider again any one of the partitions of woodkind mentioned above). It follows that (14) represents a proper generalization of the usual characterization of singular nouns.

---

[10] See Ojeda (in press) for discussion.

[11] It should be noticed that the empty subset of the universe of discourse is pairwise disjoint: the empty subset cannot have any elements —let alone two distinct elements which overlap. This should be as desired: it should be possible for semantically singular nouns to denote the empty subset of the universe.

Finally, notice that not every singular noun will be a singulative; there are many nouns in Arabic whose singular simply does not incorporate a singulative morpheme. In fact, the singulative morpheme attaches, for the most part, to collectives which belong to a particular semantic field. According to Wright (1933, 147f), singulatives are "almost entirely restricted [...] to created or natural objects. Examples of artificial or manufactured objects are very rare".[12]

5. The Dual and the Plural

A semantically singular noun of Arabic, whether singulative or not, will generally have both a dual and a plural counterpart. Consider again the singulative *beeḍa* 'egg'. We have seen that it will be singular —at least on semantic grounds. As such, it will have a dual *beeḍteen* 'two eggs' and a plural *beeḍaat* 'eggs'. To determine the semantic import of these forms we will interpret the dual and the plural inflections as follows.

(15) a. The dual inflection denotes the function which assigns, to each pairwise disjoint $F \subseteq E$, the set $\{\Sigma(G) : G \subseteq F$ and $|G| = 2\}$.
b. The plural inflection denotes a function which assigns, to each pairwise disjoint $F \subseteq E$, the set $\{\Sigma(G) : G \subseteq F\}$.

For let us suppose with tradition that the dual and the plural are derived from the singular.[13] The interpretations of *beeḍteen* 'two eggs' and *beeḍaat* 'eggs' may now proceed as indicated in (16).

(16) a. $\llbracket beeḍteen \rrbracket = \llbracket een \rrbracket(\llbracket beeḍa \rrbracket) = \{\Sigma(G) : G \subseteq \llbracket beeḍa \rrbracket$ and $|G| = 2\}$.
b. $\llbracket beeḍaat \rrbracket = \llbracket aat \rrbracket(\llbracket beeḍa \rrbracket) = \{\Sigma(G) : G \subseteq \llbracket beeḍa \rrbracket\}$

The dual *beeḍteen* may thus denote the set of kinds constituted by the doubleton subsets of the set of individual eggs of the universe of discourse. The plural *beeḍaat*, on the other hand, may simply denote the set of kinds constituted by the arbitrary subsets of the set of individual eggs of the universe of discourse. It will not escape the reader that the denotation of a plural noun will contain the denotation of its dual counterpart. In addition, it will include the denotation of its singular counterpart:

---

[12] Howell (1900, 1062f) reports on the belief that in this, Grammar reflects the Order of Creation —for just as natural things were created by God in the species and divided by Man in individuals, so they are named by collectives from which singulatives are then derived. And just as artificial things must be manufactured individually before they can be put into groups, so they are named by singulars from which plurals are then constructed.

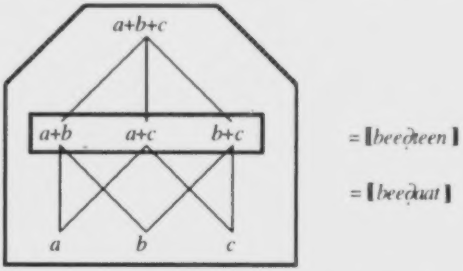
[13] See McCarthy and Prince (1990) for phonological evidence that plurals in Arabic must derive from singulars rather than from their consonantal roots.

(17) ⟦*beeḍteen*⟧⊆⟦*beeḍaat*⟧
⟦*beeḍa*⟧⊆⟦*beeḍaat*⟧

Since the converses of these containments do not hold in general, *the plural is the unmarked member in the Arabic contrast of number.*

To illustrate the semantics of the dual and the plural, let us once again assume a universe of discourse with exactly three eggs *a, b, c*. Here the dual *beeḍteen* will denote the set *{a+b, a+c, b+c}* enclosed in (18), while the plural *beeḍaat* will denote the set *{a, b, c, a+b, a+c, b+c, a+b+c}*, also enclosed in (18).

(18)



Evidence that the plural is in general unmarked with respect to the singular has been provided in McCawley (1968), Mufwene (1980), Roberts (1986), Krifka (1987), and Ojeda (in press). But similar points can be made with respect to the plural and the dual. Thus, in his grammar of Syrian Arabic, Cowell (1964, 367) observed that

> The dual need not be used every time two of anything are referred to. If the number happens to be two but is beside the point, or to be taken for granted, then the *plural* is used, just as in English: *ʕando banāt bass* 'He has daughters only' (applicable though he may have exactly two); *l-manṭo dayyeʔ ʕand l-ᵊktāf* 'The coat is tight in the shoulders'. Cf. *ʕando bəntān bass* 'He only has two daughters'; *l-manṭo dayyeʔ ʕand ᵊl-kətfēn* 'The coat is tight in both shoulders'.
>
> In reference to things that normally come in a pair, the dual is not ordinarily used in contrast to the plural, but only in contrast to the singular [...] Note that the forms *ʔəžrēn*, 'feet, legs', *ʔīdēn* 'hands, arms', *ʕēnēn* 'eyes', and *ʔadanēn* 'ears' are not duals in colloquial usage, but plurals: *ʔarbaʕ ʔəžrēn* 'four legs'. The true duals of these words have connective *t* [...] before the suffix: *ʔəžᵊrtēn, ʔīttēn, ʕēntēn, ʔədᵊntēn.*

Further evidence for the unmarkedness of the dual with respect to the plural is provided by Universal 34 of Greenberg (1963, 94): *No language has a dual unless it has a plural.* Also relevant is the general tendency towards the elimination of the dual documented in the languages of the world (cf. Vendryes 1937).

But having argued that the plural is unmarked with respect to the singular and the dual, we must acknowledge, here as elsewhere, the effects of a rather general process whereby the unmarked term of an opposition can come to denote the semantic difference between the marked and the unmarked terms. Cast in the original Praguean terms, this is the process whereby an expression which has a general meaning (*Gesamtbedeutung*) develops a specific meaning (*Grundbedeutung*).[14] Hence the plural, which can encompass the meanings of the singular and the dual, can come to denote the set of kinds constituted by strictly more than two individuals. It is, therefore, only when the plural is taken in its specific sense that it is "a form constructed to indicate *number exceeding two*" (cf. Howell 1900, 862). To illustrate, let us turn once again to a universe of discourse with but three eggs *a*, *b*, *c*. When taken in its general meaning, the plural *beeḍaat* denotes the set $\{\Sigma(G) : G \subseteq [\![\mathit{bee}\text{\d{d}}\mathit{a}]\!]\}$ enclosed in (18). When taken, however, in its specific meaning, this plural denotes the set $\{a+b+c\}$ enclosed in (8) above.

It goes without saying that the unmarkedness of the plural we have just argued for pertains only to content, not to form. Judging from the shapes of the singulative, the dual, and the plural, there seem to be no grounds for deciding which, if any, should have the unmarked form. The issue is clear only for the collective, whose form is typically contained in that of singulatives, duals, and (sound) plurals.

Now, it might be objected that our proposals confuse kinds and groups. Thus, it might be thought that plurality pertains to groups, not to kinds, whereas collectivity involves kinds, not groups. As we see it, this is a distinction without a difference. Following Quine (1969), we adopt a strongly extensional view of kinds: we simply regard kinds as groups. But the critic may reply that this extensional view of kinds cannot be right —after all, different kinds may happen to have the same instances (cf. the species *Homo* and *Homo sapiens*) and, conversely, different sets of instances may correspond to the same kind (cf. the set of whales with Moby Dick and the set of whales without Moby Dick). This reply, however, asks too much of extensional objects and too little of intensional objects. By assumption, kinds are individuals. As such, they will serve as the basis for individual concepts —say functions from possible worlds to individuals. What the critic took to be *kinds* should be *kind concepts* instead —say functions from possible worlds to kinds/groups. Now different kind concepts may correspond to the same kinds/groups and, conversely, different kinds/groups may correspond to the same concept.

---

[14] See Waugh (1976, 94-98) and the references cited there.

In any event, the view of kinds we have adopted here is not grounded on philosophical conviction but rather on linguistic fact. Notice that Arabic collectives are characterized as denoting either groups or kinds. Thus, on the one hand, collectives have been taken to denote "a class or mass of things" (cf. Abdel-Massih et al. 1979, 49). On the other hand, they have been taken to denote "the species as a whole" (Harrell 1962, 78), and as having "generic reference" (Holes 1990, 149). The two aspects of the collective denotation are brought together by Wright (1933, 147), who describes the collective as expressing "the genus or whole". It follows that to distinguish between groups and kinds would only lead us to miss a generalization concerning the semantics of the Arabic collective. Similar points can be made about the singulative. Cowell (1964, 297) points out, for example, that "a singulative designates an individual *unit* or *instance*" (emphasis supplied). And further evidence for collapsing groups and kinds comes from multal and complex plurals, as we will presently see.

6. The Paucal and the Multal

A plural in Classical Arabic is either sound (*pluralis sanus*) or broken (*pluralis fractus*). A plural is sound if it is formed by suffixation onto a usually unchanged singular stem; a plural is instead broken if it is formed primarily by the alteration of the singular stem. Interestingly, one and the same singular may sometimes have both a sound and a broken plural. Consider for instance the collective *šağar* 'trees'. Its singulative *šağarat* has two plurals. One of them is sound (*šağarāt*); the other is broken (*ʔašğār*).[15]

Broken plurals are formed according to more than thirty patterns of daunting intricacy (cf. Wright 1933, 199-234). Of these patterns, there are four which govern the formation of the "plurals of paucity" (*pluralis paucitatis*). The rest produce "plurals of multitude". The plurals of paucity and multitude are so called because whenever used contrastively, the plural of paucity is "used only of persons and things which do not exceed *ten* in number" (Wright 1933, §307), while the plural of multitude "properly indicates what is above ten to infinity" (Howell 1900, 885). Sometimes the plurals of paucity and multitude are not used contrastively. This happens when a singular has but one plural. In such case, that plural denotes in accordance with (15b).

In Classical Arabic, the opposition between paucity and multitude was not pertinent to the sound plural: "the two sound plurals [i.e. the masculine and the feminine] are common to paucity and multitude", writes Howell (1900, 886), "and apparently they denote *unrestricted pluralization*, without regard to paucity or multitude, so that they are applicable to both." The semantics given in (15b) is thus appropriately general for the sound plural of Classical Arabic. Now precise semantics for the paucal and the multal plurals are called for. They are given in (19).

---

[15] See Fischer (1972, §83).

(19) a. The paucal inflection denotes a function which assigns, to each pairwise disjoint $F \subseteq E$, the set $\{\Sigma(G): G \subseteq F \text{ and } |G| \leq 10\}$.
b. The multal inflection denotes a function which assigns, to each pairwise disjoint $F \subseteq E$, the set $\{\Sigma(G): G \subseteq F \text{ and } |G| > 10\}$.

Incidentally, whenever the multal inflection is added onto a singular which denotes a set with less than eleven elements, the empty set will be denoted. This should be as desired.

The opposition between the multal and the paucal is likewise neutralized in the collective, which "is applied to the few and the many" (cf. Howell 1900, 1053). And even though multitude may be "imported" from the collective, "the import of multitude is not from the expression, but only from its indicated [sic], since it is indicative of genus, which imports multitude". The collective is not plural, as it "does not indicate *units*". Rather, the expression is constituted "to denote *what constitutes the special quiddity*" (cf. Howell 1900, 1054).

To illustrate the distinction between the paucal and the multal, let us return to the two plurals of *šağarat* 'tree' mentioned above. As we have indicated, one of these plurals (*šağarāt*) is sound. It thus denotes the set of trees "without regard to paucity or multitude". The other (*ʔašğār*), is broken. Moreover, it is a plural of paucity. It thus denotes the set of groups of ten trees or less. Clearly,

(20) $[\![\textit{ʔašğār}]\!] \subseteq [\![\textit{šağarāt}]\!]$

In the modern vernaculars, few sound plurals alternate with a broken plural. Mitchell (1956, 94) points out, for example, that broken alternatives to sound plurals are "comparatively rare" in Cairene Arabic, and Cowell (1964, 369) states that a contrast between a sound and a broken plural holds only "sometimes". Yet, whenever a sound plural alternates with a broken plural, the sound plural is interpreted as a plural of paucity. As a consequence of this, the broken plural, whose general meaning (*Gesamtbedeutung*) is that of an unrestricted plural, develops the appropriate specific meaning (*Grundbedeutung*) —namely that of a plural of multitude.[16]

In Cairene Arabic for example, Mitchell (1962, 42) contrasts the sound plural *šagaráat* '(a few) trees', with the broken plural *ʔašgáar* '(different kinds of) trees', and says that the former is "a little plural", while the latter is "a big plural". Similar contrasts can be drawn from Syrian Arabic (cf. Cowell 1964, 369). Here the sound plural *samakāt* 'fish, fishes' contrasts with the broken plural *ʔasmāk* '(many or various) fish'; the sound plural *dəbbānāt* 'flies' is distinguished from the broken plural *dababīn* '(many or various) flies', and the sound plural *mōžāt* 'waves' is set against the broken plural *ʔamwāž* '(many or extensive) waves'.

---

[16] It would be interesting to determine why the vernaculars use the sound plural for paucity and the broken plural for multitude —especially in light of the fact that broken plurals in *ʔa-* were characteristic of plurals of paucity in the Classical language (cf. Fischer 1972, §100).

Along parallel lines, some singular nouns of Maltese may have two plurals. One of these plurals is "determinate"; the other "indeterminate". Determinate plurals are used with numerals from two to ten; indeterminate plurals are used "of things belonging to a certain class taken in general" (Sutcliffe 1936, §§21b, 55d), presumably when they are more than ten. Examples include *elf* 'thousand', which has both a determinate plural *elef* (cf. *sitt elef* 'six thousand'), and an indeterminate plural *elûf* (cf. *elûf ta' kotba* 'thousands of books').

It should not escape the reader that at least some of these broken plurals may refer either to groups or to kinds. The clearest documented cases come from Syrian Arabic where, as we have seen, we find broken plurals like *ʔasmāk* '(many or various) fish' and *dababīn* '(many or various) flies'. More generally, the plurals of multitude are said to "indicate abundance or variety" (cf. Cowell 1964, 369). Again, to distinguish between groups and kinds would only lead us to miss a generalization concerning, in this case, the semantics of the multal.

Finally, evidence that the broken plural is truly the unmarked or unrestricted plural is provided by the fact that some broken plurals can actually be used either as plurals of paucity or as plurals of multitude —even when they alternate with perfectly legitimate plurals of paucity. Consider for example the broken plural *wrāq* 'leaves'. It may be used either as a plural of abundance or as a plural of paucity even though it has in the sound plural *waraʔāt* a perfectly legitimate paucal counterpart. Or consider the broken plural *wrūd* 'flowers'. It may be used either as a paucal or as a multal even though it has a paucal counterpart in the sound *wardāt*. These broken plurals are thus rightly called "all-purpose plurals" (cf. Cowell 1964, 369).[17]

7. The Plural of the Plural

But the complexities of Arabic number do not stop here. Some broken plurals of Classical Arabic can "assimilate" to singulars, and can then be dualized and pluralized. The effect of such secondary formations is the denotation of dualities or pluralities of groups or kinds:

> Necessity sometimes leads to pluralization, as to dualization of the plural. The broken plural is sometimes pluralized, when they mean to intensify the

---

[17] Incidentally, according to Cowell (1964, 369), the broken plurals of multitude are the plurals of collectives (while the sound plurals of paucity are the plurals of singulatives). It is unlikely, however, that this attractive idea can be maintained in view of the fact, noted by Cowell himself, that there are no collectives for "all-purpose" broken plurals like *sagāyer* 'cigarettes', *xiyam* 'tents', and *ḥayāya* 'snakes'. Moreover, given the proposals we have advanced concerning plurals and collectives, every collective would be its own plural, so the plural of a collective would be indistinguishable from the collective itself.

> *multiplication*, and to notify *different kinds* of that sort, by assimilation of the plural expression to the singular (Howell 1900, 1071).

Consider for instance the singular *rahṭun* 'tribe'. It has a broken plural *ʔarhuṭun* 'association of tribes' which has, in turn, a broken plural *ʔarāhiṭu* 'associations of tribes'. Or consider *yadun* 'hand'. It has a plural *ʔaydin* 'assistance' whose plural is *ʔayādin* 'assistances'. Or consider, finally, *baladun* 'village', with plural *bilādun* 'land', and secondary plural *buldānun* 'lands' (cf. Fischer 1972, §106).

As these examples make clear, the meanings of the primary plurals are not entirely predictable from the meaning of plurality (15b), and the meanings of the corresponding stems.[18] It may thus be appropriate to regard the first pluralization as a derivational process which produces a new singular out of an old one (cf. Kuhn 1982, 62). It seems more likely, however, that the new singular arises diachronically rather than synchronically —i.e. as the historical reanalysis of a plural as a singular (cf. Brockelmann 1908, §239e). In either case, we have two singulars; one is *basic* and the other is *derived*. Basic singulars are *rahṭun* 'tribe', *yadun* 'hand', and *baladun* 'village'. Derived singulars are *ʔarhuṭun* 'association of tribes', *ʔaydin* 'assistance', and *bilādun* 'land'. A "plural of the plural" is simply the result of pluralizing a *derived* singular in conformity with (15b).

But how is the meaning of a basic singular related to the meaning of a singular derived therefrom? To answer this question, let us bear in mind that a singular must always denote a pairwise disjoint set. But every pairwise disjoint set is either the partition of some kind or else the empty set. A basic singular will therefore denote either the partition of some kind or else the empty set. A derived singular faces the same disjunction. It will denote either the partition of some kind or else the empty set. Interestingly, however, if a basic singular and its derived counterpart are not empty, they will denote different partitions *of the same kind*. What is more, we may claim that

(21) Every derived singular denotes a coarser partition than the one denoted by its basic singular source.

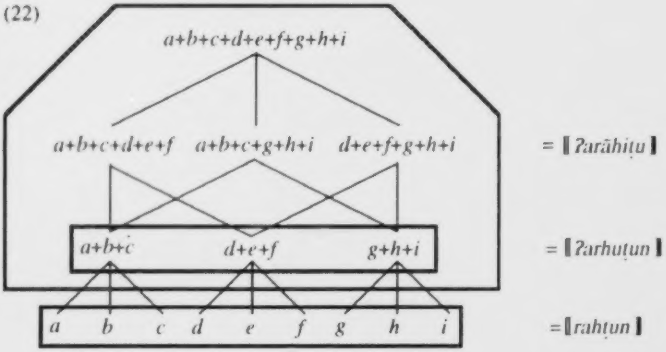
Typically, a basic singular will denote the individuation of a kind —the set of proper individuals which instantiate a kind. A derived singular, on the other hand, will tend to denote a coarser partition of a kind instead. Thus *rahṭun* 'tribe' will denote the trivial partition of tribekind into individual tribes while *ʔarhuṭun* 'association of tribes' will denote the nontrivial partition of tribekind into tribal associations. The relation between the denotations of the two singulars will thus be as indicated in (21).

---

[18] To describe the semantics of *ʔarhuṭun*, Fischer gives 'einige Sippen = Sippenverband'; for *ʔaydin*, he gives 'einige Hände, Hilfeleistung'; for *bilādun* he gives 'Ortschaften = Land'. If these were true equations, they would be unnecessary.

To visualize the relations between the derivatives of *rahṭun* 'tribe', let us assume a universe of discourse with nine tribes *a, b, …, i*, constituting three associations. Relative to this universe of discourse, the derivatives of *rahṭun* 'tribe' may denote as diagramed in (22).

(22)



Naturally, a partition will usually have many coarser counterparts. This means that the denotation of a derived plural will not always be determined given the denotation of its basic singular. (21) only *constrains* the semantics of derived singulars; it does not *determine* it. In addition, an association of tribes is more than a group of tribes; an assistance is more than a collection of hands, and a land is more than a bundle of villages. Derived plurals may therefore *specialize* in meaning and refer only to particular groups, collections or bundles. But this does not detract from the fact that the final, specialized, meaning required an intermediary coarsening of the initial meaning. It is only this intermediate stage —one which is nevertheless recorded in the morphology— that (21) seeks to describe.

In any event, the reader will have noticed that both the plural of the plural and the dual of the plural again argue for collapsing groups and kinds. As Howell (1900, 1071) put it in the quotation above, these complex formations either "intensify the multiplication" or else "notify different kinds". Plurality may therefore convey either a multiplicity of groups or a multiplicity of kinds. See also the following section, where the dual of the plural is described as denoting "the duality of the *species* or the *set*" (Fischer 1972, §108b, emphasis added).

It should be added that some plural plurals can be pluralized yet again. The singular *firqat* 'sect', for example, has a plural *firaq*, a plural plural *ʔafrāq*, and a plural plural plural *ʔafārīq* (Wright 1933, 232). Such treble formations can be straightforwardly accommodated by our proposals: *firqat* may denote the set of individual sects. This set is a partition of sectkind. It is, moreover, a refinement of the partition denoted by *firaq*, which is in turn a refinement of the partition denoted by *ʔafnāq*. The triple plural *ʔafārīq* denotes but the closure of the latter. Further examples of triple plurality can be found in Wright (1933, 231f) as well as in Howell (1900, 1077f) —who also records the fact that "some disapprove" of such formations...

Finally, we should notice that if we take plurals in their specific meanings (*Grundbedeutungen*), then it is indeed true that "the plural plural is not unrestrictedly applicable to less than *nine*, as the plural of the singular is not applicable to less than *three*, except by a trope" and, when triple pluralization is considered, "the least number necessarily implied would be *twenty-seven*" (Howell 1900, 1077). As has been illustrated in (22), each specific plural would require at least three elements in its source.[19]

8. The Dual of the Plural

Similar considerations apply to the dual of the plural. Thus, corresponding to the singular *jamalun* 'male camel', there is the plural *jimālun* 'herd of male camels', whose dual is *jimālāni* 'two herds of male camels'; corresponding to the singular *rumḥun* 'spear', there is a plural *rimāḥun* '[clump of] spears', whose dual is *rimāḥāni* 'two clumps of spears'; corresponding to the singular *aṣlun* 'fundamental principle', there is the plural *uṣūlun* '[group of] fundamental principles', whose dual is *uṣūlāni* 'two [groups of] fundamental principles, namely those of theology and law' (cf. Howell 1900, 855f, 1085; Wright 1933, 191; Fischer 1972, §108b).

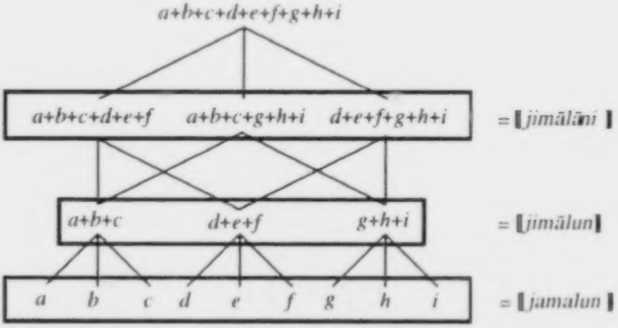
Here we again have derived singulars which denote partitions other than individuations: *jimālun* denotes a partition of the kind of male camels into herds, *rimāḥāni* denotes a partition of spearkind into clumps, and *uṣūlun* denotes a partition of fundamental principles into groups. Each one of these partitions can be dualized. It thus becomes an expression which denotes "die Zweiheit der Gattung oder Menge" (Fischer 1972, §108b); a form with the interpretation of two collections, two parties, two bodies, or two troops, of the objects in question (cf. Howell 1900, 855; Wright 1933, 190). The semantics of the derivatives of *jamalun* can be visualized by means of (23), where we assume a universe of discourse with nine male camels *a, b, ..., i* constituting three herds.

Closely related to the dual of the plural is the case of the dual of a singular "to the meaning of which the idea of plurality attaches" (Wright 1933, 234). Consider for instance *ibilun* 'herd of camels' and *ganamun* 'flock of sheep or goats' (= German *Kleinviehherde*). Their respective duals are *ʔibilāni* 'two herds of camels', and *ganamāni* 'two flocks of sheep or goats' (cf. Howell 1900, 855; Wright 1933, 179, 190f; Fischer 1972, §§ 85, 108b). As to their plurals, they are *ʔābāl* 'herds of camels' and *ʔagnām* 'flocks of sheep or goats' (cf. Brockelmanm 1960, §77b). The semantics of the derivatives of *ʔibilun* can be visualized by means of (24), where we assume a universe of discourse with six camels *a*, *b*, ..., *f* constituting three herds.

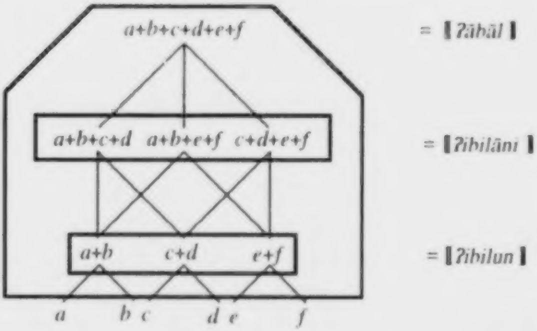
---

[19] Wright (1933, 232) indicates that secondary plurals can be used either when the objects denoted are at least nine in number, or when their number is indefinite —according, presumably, to whether the objects are enumerated or not (cf. Fleisch 1961, §65p).

(23)


a+b+c+d+e+f+g+h+i
a+b+c+d+e+f
a+b+c+g+h+i
d+e+f+g+h+i
= ⟦jimālāni⟧
a+b+c
d+e+f
g+h+i
= ⟦jimālun⟧
a
b
c
d
e
f
g
h
i
= ⟦jamalun⟧

(24)


a+b+c+d+e+f
= ⟦ʔābāl⟧
a+b+c+d
a+b+e+f
c+d+e+f
= ⟦ʔibilāni⟧
a+b
c+d
e+f
= ⟦ʔibilun⟧
a
b
c
d
e
f

The difference between the dual of the plural and the dual of the singular "to the meaning of which the idea of plurality attaches" lies in the fact that only the former involves an intermediary plural —even if only etymologically. This is reflected in the preceding diagrams by having more than two camels make up a herd in (23), as three is the lower bound for a proper plural.

Again, the derived singulars involved in the dual of the plural cannot be determined by (21); they can only be constrained by it. The reasons for this are the same as the ones advanced in the case of the plural of the plural. First, a partition will tend to have more than one coarser counterpart. Second, the derived singular involved in the dual of the plural usually involves semantic specialization. Thus, herds, clumps, and flocks are more than simple groups/kinds of objects. Along similar lines, the principles of theology and law denoted by *uṣūlāni* are only two of the groups of principles that the derived singular *uṣūlun* '[group of] fundamental principles' may denote. Yet, (21) is not otiose; it constrains the selection of the (semantic) singular whose specialization will dualize.

References

Abdel-Massih, Ernest et al. (1979) *A Reference Grammar of Egyptian Arabic*. Center for Near Eastern and North African Studies. The University of Michigan, Ann Arbor.

Brockelmann, Carl (1908) *Grundriss der Vergleichenden Grammatik der Semitischen Sprachen* I. Berlin, Reuther and Reichard. Reproduced by Georg Olms Verlagsbuchhandlung, Hildesheim, 1966, from which we cite.

Brockelmann, Carl (1960) *Arabische Grammatik*. Fourteenth Edition. Leipzig, Otto Harrassowitz.

Carlson, Greg (1978) *Reference to Kinds in English*. Ph.D. dissertation, University of Massachusetts at Amherst. Revised for the series Outstanding Dissertations in Linguistics. New York, Garland, 1982, which we cite.

Cowell, Mark (1964) *A Reference Grammar of Syrian Arabic*. Washington, Georgetown University Press.

Erwin, Wallace (1963) *A Short Reference Grammar of Iraqi Arabic*. Washington, Georgetown University Press.

Fischer, Wolfdietrich (1972) *Grammatik des Klassischen Arabisch*. Wiesbaden, Otto Harrasowitz.

Fleisch S. J., Henri (1961) *Traité de Philologie Arabe*, Volume I. Beyrouth, Imprimerie Catholique.

Gardner, Martin (1978) "Mathematical Games". *Scientific American* 238(5): 24-30.

Grätzer, George (1978) *General Lattice Theory*. New York, Academic Press.

Greenberg, Joseph (1963)"Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements". In Joseph Greenberg (Ed.) *Universals of Language*. Cambridge, MIT Press, pp. 73-113.

Greenberg, Joseph (1977) "Numeral Classifiers and Substantival Number: Problems in the Genesis of a Linguistic Type". In Adam Makkai et al. (Eds.) *Linguistics at the Crossroads*. Padova/Lake Bluff, Liviana Editrice/Jupiter Press.

Harrell, Richard (1962) *A Short Reference Grammar of Moroccan Arabic*. Washington, Georgetown University Press.

Holes, Clive (1990) *Gulf Arabic*. Croom Helm Descriptive Grammars. London, Routledge.

Howell, Mortimer (1900) *A Grammar of the Classical Arabic Language*, Part I. Published under the authority of the Northwest Provinces and the Government of Oudh. Allahabad.

Krifka, Manfred (1987)"Nominal Reference and Temporal Constitution: Towards a Semantics of Quantity" [= Forschungsstelle für natürlich-sprachliche Systeme, Bericht 17]. Tübingen, Universität Tübingen.

BEST COPY AVAILABLE

Kuhn, Wilfried (1982) "Formale Verfahren der Technik KOLLECTION". In Hansjakob Seiler and Franz Josef Stachowiak (Eds.) *Apprehension: Das sprachliche Erfassen von Gegenständen* II. Tübingen, Gunter Narr Verlag.

Link, Godehard (1983) "The Logical Analysis of Plurals and Mass Terms: A Lattice-Theoretical Approach". In Rainer Bäuerle et al. (Eds.) *Meaning, Use, and the Interpretation of Language*. Berlin, Walter de Gruyter.

McCarthy, John and Prince, Allan (1990) "Foot and Word in Prosodic Morphology". *Natural Language and Linguistic Theory* 8: 209-283.

McCawley, James (1968) Review of *Current Trends in Linguistics* 3. *Language* 44: 556-593.

Mitchell, Terence (1956) *An Introduction to Egyptian Colloquial Arabic*. London, Oxford University Press.

Mitchell, Terence (1962) *Colloquial Arabic*. London, Hodder and Stoughton.

Mufwene, Salikoko (1980) "Number, Countability, and Markedness in Lingala LI-/MA- Noun Class". *Linguistics* 1980: 1019-1052.

Ojeda, Almerindo (in press) *Linguistic Individuals*. CSLI Lecture Notes Series 31. Stanford, Center for the Study of Language and Information.

Quine, Willard (1969) "Natural Kinds". In Nicholas Rescher et al. (Eds.) *Essays in Honor of Carl G. Hempel*. Dordrecht, Reidel, pp. 5-23.

Roberts, Craige (1986) *Modal Subordination, Anaphora and Distributivity*. Ph.D. dissertation, University of Massachusetts at Amherst.

Sutcliffe S. J., Edmund (1936) *A Grammar of the Maltese Language*. London, Oxford University Press.

Talmoudi, Fathi (1980) *The Arabic Dialect of Sūsa (Tunisia)* [= *Orientalia Gothoburgensia* 4]. Gothenburg, Acta Universitatis Gothoburgensia.

Tarski, Alfred (1956a) "Foundations of the Geometry of Solids". In his *Logic, Semantics, Metamathematics*. Indianapolis, Hackett, 1983, pp. 24-29.

Tarski, Alfred (1956b) "On the Foundations of Boolean Algebra". In his *Logic, Semantics, Metamathematics*. Indianapolis, Hackett, 1983, pp. 320-341.

Vendryes, Joseph (1937) "Sur le Nombre Duel". Reprinted in his *Choix d'Études Linguistiques et Celtiques* . Paris, Libraire C. Klincksieck, 1952, pp. 91-101, which we used.

Waugh, Linda (1976) *Roman Jakobson's Science of Language*. Lisse, The Peter de Ridder Press.

Wright, William (1933) *A Grammar of the Arabic Language*, Volume I. Cambridge, Cambridge University Press.

Zeuss, Johann Kaspar (1853) *Grammatica Celtica*. Lipsiae, apud Weidmannos.

Almerindo E. Ojeda
Linguistics Program
University of California
Davis, CA 95616
aeojeda@ucdavis.edu

Distributivity and Logical Form in the Emergence of Universal Quantification

William Philip
University of Massachusetts, Amherst

Recent research on four-year-olds' and five-year-olds' knowledge of quantification has made two strongly attested and somewhat unexpected observations. First, it appears there is a stage in the emergence of universal quantification when the child fails to make consistent use of a syntactic mechanism---such as May's (1977, 1985) 'Quantifier Raising' (QR), or Heim's (1982) 'NP-prefixing'---to derive a restriction on the domain of quantification. This stage occurs well after the child has firmly grasped that universal quantifiers assert the completeness or exhaustive denumerability of some contextually relevant set. The second observation is that children at this stage have a strong, non-adult-like tendency to insist on distributive readings, not only with universal quantifiers (Drozd and Philip, 1992) but also with plural pronouns (Crain and Miyamoto, 1991; Miyamoto, 1992). Hearing the word every or how many can trigger such a 'fixation' on the distributive reading that the child consistently rejects collective and cumulative readings readily available to the adult. This latter observation is all the more surprising given the crosslinguistic evidence of the preference in adult grammars for cumulative readings (Gil, 1982).

In this paper I will argue that these two seemingly unrelated phenomena derive from the same underlying cause, namely (i) that the child prefers to quantify over events rather than objects (Philip and Aurelio, 1991; Philip and Takahashi, 1991; Takahashi, 1991), and (ii) that the child derives a restriction for the domain of quantification by means of a non-syntactic, pragmatic mechanism (cf. Philip, 1991a, 1991b, to appear) that may be loosely characterized as a form of 'accommodation' in the sense of Lewis (1979).

The first claim---which I will call the EVENT QUANTIFICATIONAL HYPOTHESIS---is based on the assumption that quantification over events or situations is a fundamental semantic capability (cf. Davidson, 1966; Higginbotham, 1983; Barwise and Perry, 1983; Kratzer, 1989; Parsons, 1990).[1] The supposition is that children (and adults under certain conditions) resort to quantifying over events in their interpretation of universal quantifiers because it achieves a net reduction of the total processing load. In other terms, it provides an alternative to type-shifting---a presumably costly operation (cf. Partee and Rooth, 1983).

---

[1] In this paper I will not distinguish between 'situations' in the sense of Barwise and Perry (1983) and 'events' in the sense of, say, Higginbotham (1983).

The second claim is that in the absence of QR (or like mechanism) the restriction to the domain of quantification is derived in a very non-adult-like but nonetheless rule-governed manner. The rule in question---which I will call the RESTRICTOR RULE---may be seen to instantiate the Subset Principle (e.g. Berwick, 1985). According to this general law of language acquisition, the child initially acquires a new rule of grammar in the most restrictive of its available forms, and thereby adopts an option that generates a subset of the adult grammar. In this manner (arguably only in this manner) subsequently assimilated positive evidence is able to modify the initial posit. Given quantification over events, then, the Restrictor Rule is seen to provide the most restrictive form of universal quantification because it supplies the largest possible linguistically[2] determined restriction of the domain of quantification, which increases the quantified sentence's falsifiability by positive evidence.

The paper is organized as follows. First I will present a phenomenon well-attested in children's use of universal quantifiers---which I call the SYMMETRICAL INTERPRETATION---that strongly argues against the view that QR is well-established in the grammars of young children, even as late as five years of age. Space limitation prevent a detailed discussion of why arguments in the literature to the contrary are not compelling; however, briefly put, the problem is that the evidence cited either fails to demonstrate that Move α is the operant principle behind the observed phenomenon (Lee, 1986; Chien and Wexler, 1989), or it is not very firmly established (Miyamoto, 1992). Having examined basic properties of the symmetrical interpretation that highlight its nonsyntactic nature, I will next present evidence that it is nonetheless a truly linguistic phenomenon, not an effect of some meta-linguistic, general cognitive mechanism. Then, I will give my account of it. Finally, I will show how my account predicts children's observed preference for a distributive reading with universal quantifiers.

The symmetrical interpretation: nonsyntactic aspects

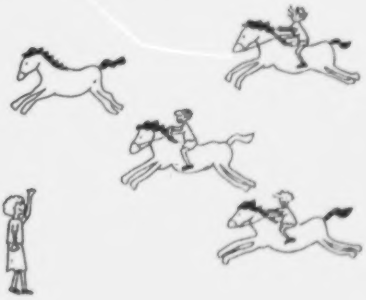
Evidence of the non-compositional way in which young children derive a restriction on the domain of quantification can easily be overlooked since the truth conditions of the symmetrical interpretation differ only minimally from those of an adult interpretation of universal quantification. The difference is revealed, however, by showing a child a picture such as in (1.a) and asking whether every boy is riding a pony. The typical response

---

[2] As opposed to non-linguistic restriction of this domain in terms of a relevant 'context set' (Stalnaker, 1978) or 'presupposition set' (Rooth, 1985). Children master this more basic sort of restriction of the domain of quantification long before they face the problem of interpreting universal quantifiers (see also footnote 8).

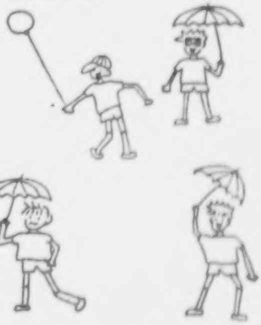
(approximately 75% of the time) is *no* for this experimental condition, with reference made to the riderless pony (not to the mom) as the reason for the negative response. The same child, however, will give adult-like responses to the questions in the control conditions exemplified in (1b)-(1.d).

(1) a.transitive



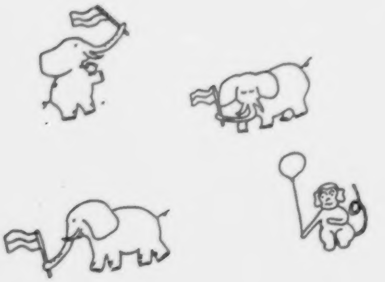
---Is every boy riding
a pony?
---No, not that one!

b.control 1



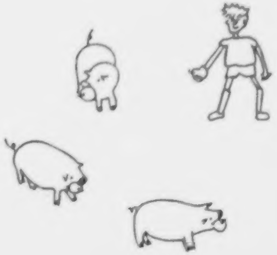
---Is every boy holding
an umbrella?
---No, one has a balloon

c.control 2



---Is every elephant
holding a flag?
---Yea

d.control 3



---Is every pig eating
an apple?
---Yea

Restricting our attention to the non-adult-like response in (1.a)---and abstracting away from interrogative mood---, the meaning the child gives to the adult's question may be provisionally described by the logical representation in (2), which happens also to fit as a description of an available adult meaning of *The boys are riding the ponies* (Langendoen, 1978). It may also be likened to the 'complete group' interpretation of Kempson and Cormack (1981), and the 'strong symmetric' interpretation of Gil (1982).

(2) $((\forall x \in \text{boy}')(\exists y \in \text{pony}')[\text{ride}'(x,y)] \ \& \ (\forall y \in \text{pony}')(\exists x \in \text{boy}')[\text{ride}'(x,y)])$

Aside from a formidable mapping problem, this 'Sum of Plurals' interpretation (cf. Chien and Wexler, 1989) fails to achieve descriptive adequacy in that it incorrectly predicts a negative response for control condition 3 in (1.d). Keeping this in mind, it is nonetheless useful as a first pass representation of the meaning the child is entertaining.

The symmetrical interpretation phenomenon is well known in the psychological literature (for overviews see Macnamara, 1982, 1986 and Braine and Rumian, 1983). Since its discovery by Inhelder and Piaget (1964), with French *tous*, evidence of it has been documented with English *all* and *each* (Donaldson and McGarrigle, 1973; Donaldson and Lloyd, 1974; Bucci, 1978) and with *every* (Philip and Aurelio, 1991; Philip and Takahashi, 1991; Takahashi, 1991; Philip, 1991a, 1991b, to appear), with Chinese *mei* (Chien and Wexler, 1989) and with Japanese *dono-mo* and *minna* (Takahashi, 1991; Kobuchi and Philip, 1990). In a recent set of comparable studies on *every*, involving a total of 129 four-year-olds, the symmetrical interpretation was detected on average 74% of the time for the experimental condition represented in (1a)--henceforth, the *transitive condition*---as shown in (3).

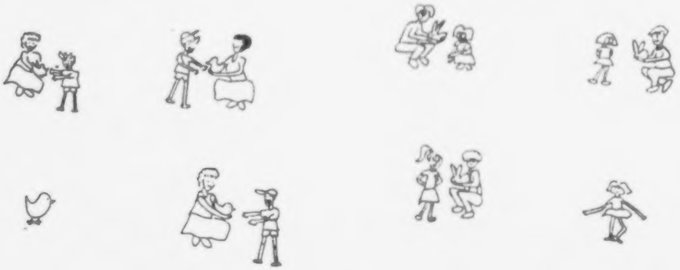
(3)

study	n	mean age	incidence of symmetrical interpretation
Philip and Aurelio 1991	20	4-3	84%
Philip and Takahashi 1991	9	4-6	80%
Philip (to appear)	41	4-9	70%
Philip 1991b	59	4-6	73%
	129	4-6	74%

The symmetrical interpretation proves to be fairly insensitive to syntactic structure. For an experimental condition formally comparable to the transitive condition in (1a) Donaldson and Lloyd (1974) found no significant effect on the phenomenon when they moved quantifiers *all* and *each* to floated positions. This finding was replicated in Drozd and Philip (1992), where in a study of 18 four-year-olds (mean age 4-9) the symmetrical interpretation was observed 64% of the time for the transitive condition with

sentences such as *The boys are all riding a pony* as against a virtually identical 67% of the time with *Every boy is riding a pony*.[3] Further evidence of the insignificance of syntax comes from the observation that placing the quantifier in object position (e.g. *Is a boy is riding every horse?*) has no significant effect on the phenomenon (Philip and Aurelio, 1991; Philip and Takahashi, 1991).[4] Nor does putting the indefinite NP in an embedded context (e.g. *Is every boy who's riding a pony waving?*) appear to have any effect (Philip and Aurelio, 1991). Finally, contra the earlier finding of Philip (1991a), we may observe that argument structure does not appear to interact with the phenomenon. Thus, for example, the pictures in (4.a) elicits the same degree of symmetrical interpretation with *Is every mom showing a boy a duck?* as does *Is every mom showing a duck to a boy?*, and likewise for the picture in (4.b) with respect to the sentences *Is every dad giving a girl a rabbit?* and *Is every dad giving a rabbit to a girl?* (Philip, 1991b).

(4) a. extra object b. extra recipient



Linguistic aspects of the phenomenon

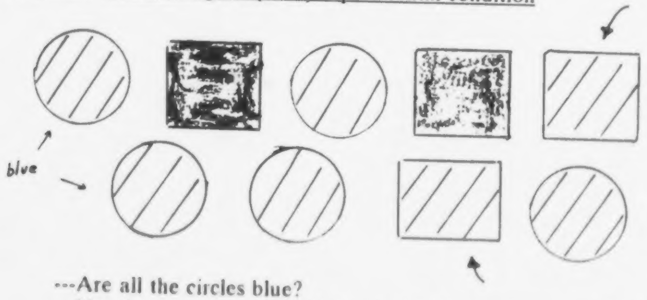
Given the seemingly non-syntactic nature of symmetrical interpretation it is not surprising that it has often been discounted as meta-linguistic phenomenon arising from an innate (Gestaltian) preference for symmetry (Inhelder and Piaget, 1964; Revlis and Leirer, 1980), or, in contemporary terms, 'cognitive isomorphism' (Roeper and de Villiers, 1991). The first theory of the phenomenon considered it symptomatic of the child being in an early stage in the development of logical competence. According to Inhelder and Piaget (1964), during the stage of the 'non-graphic collection' children cannot distinguish between the logical relations of class membership and sublogical, part-whole relations, and consequently 'all they can do to decide whether all the X's are y is to ascertain whether or not the collection of X's coincides with that of Y's...'(p.65). Formalizing this hypothesis in terms of set subtraction, we can see how it successfully accounts for cases of symmetrical interpretation with sentences like *Are all the circles blue?* when asked of the picture in (5.a). If the child is entertaining for this sentence a logical representation roughly of the form in (5.b), then he or she will answer *no* because of the presence of the blue squares; $\{y|y\in \text{blue}'\} - \{x|x\in \text{circle}'\}$ is not null. This accords with Inhelder and Piaget's (1964) observations. Their account, however, cannot be extended to the cases of symmetrical interpretation found with the transitive condition of (1.a). Under Inhelder & Piaget's (1964) account, the child's logical representation of *Is every boy riding a pony?* would be as roughly portrayed in (5.c). But this falsely predicts a *yes* response since it is the case that $\{y|y\in \text{ride}^\wedge\text{pony}'\} - \{x|x\in \text{boy}'\} = \wedge$.

---

[3] The same study found no significant difference with respect to incidence of symmetrical interpretation between *all* and *every* across a variety of conditions.

[4] The picture used for this condition showed five boys: three riding one pony each, two more just watching.

(5) a. Inhelder and Piaget's (1964) experimental condition



---Are all the circles blue?
---No, there are squares and circles (i.e. some squares are blue too)

b. $(\{x|x\in \text{circle}'\} - \{y|y\in \text{blue}'\} = \wedge)\ \&\ (\{y|y\in \text{blue}'\} - \{x|x\in \text{circle}'\} = \wedge)$

c. $(\{x|x\in \text{boy}'\} - \{y|y\in \text{ride}^\wedge\text{pony}'\} = \wedge)$
$\&\ (\{y|y\in \text{ride}^\wedge\text{pony}'\} - \{x|x\in \text{boy}'\} = \wedge)$

A second major psychological account of symmetrical interpretation comes from the literature on the adult processing of syllogisms. Under certain (fatigue-inducing) conditions adults can be found to produce an interpretation of universal quantifiers strikingly similar to that of the four-year-olds. To account for this Revlis (1975) and Revlin and Leirer (1978, 1980) have proposed the 'conversion model', according to which an original input linguistic representation of the form [all A are B] is transformed into a 'converted' output representation of the form [all B are A], where A is the subject NP and B is a predicate nominal. Both the original and the converted representation are stored in memory but since the memory stack operates on a first-in-last-out basis the converted representation always has priority. This proposal successfully accounts for the symmetrical interpretation observed under Inhelder and Piaget's (1964) experimental condition exemplified in (5.a), since it would not be the case that all the blue ones (B) are circles (A). However, again, the logical extension of this proposal[5] to account for instances of symmetrical interpretation under the transitive condition exemplified in (1.a) falsely predicts a *yes* response: it is true of the picture in (1.a) that all the pony-riders are boys.

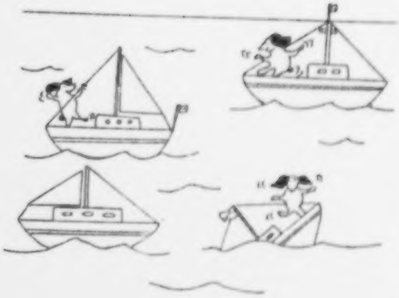
Despite the difficulties of these particular psychological theories one might still maintain, vaguely, that the phenomenon is due to a general, non-linguistic preference for symmetry. There are basic empirical problems with this general hypothesis, however. First, studies of children's perception of symmetry show that it is not until five or six years of age that (vertical) symmetry has a significant facilitating effect on pattern recall (Boswell, 1976). This is well after the onset of the symmetrical interpretation phenomenon, which may occur as early as 3 years of age---simultaneous, it appears, with acquisition of the basic meanings of *every and* each. Secondly, under the assumption that the phenomenon is purely cognitive in nature we would expect perceptual encoding alone to elicit it just as readily as linguistic input containing a universal quantifier. But this is a false prediction. When the linguistic input is a transitive predicate and a universally quantified subject the picture in (6) elicits the characteristic symmetrical interpretation response (e.g. *No, it takes a dog to dance and that boat doesn't have any*). This is the typical response for the transitive condition. For the same picture, however, there is a dramatic inhibition of the phenomenon with alternative linguistic input, as shown in the tables in (7). The contrast in the incidence of non-adult-like responses between the transitive condition on the one hand and the INTRANSITIVE and INCORPORATED conditions on the other is highly significant.[6]

---

[5] Since under standard assumptions NP and VP are of the same logical type, namely <e,t>.

[6] The fact that there is any symmetrical interpretation at all with the intransitive, bare plural and incorporated conditions is due partially to a perceptual set effect (cf. Mehler and Carey, 1976), partially to the fact that for younger children the phenomenon is not inhibited under these conditions.

(6)



transitive
---*Is every dog riding a boat?*
---*No*

intransitive
---*Is every dog dancing?*
---*Yea*

bare plural
---*Are dogs riding boats?*
---*Yea*

incorporated
---*Is every dog a boat-rider?*
---*Yea*

(7) a.Philip (1991b): n = 59; mean age 4-6

transitive	intransitive	bare plural
73%	31%	34%

(s.e. 5%)

(transitive vs intransitive/bare plural: p = 0.000)

b.Drozd and Philip (1992): n = 18; mean age 4-9

transitive	incorporated
67%	44%

(p = 0.0093)

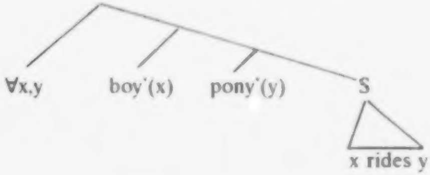
The facts in (7) show that symmetrical interpretation is not independent of linguistic content or form. The input sentence must contain a universal quantifier (cf. bare plural condition) and it must also contain one or more unincorporated indefinite NPs. This suggests that the mechanism producing the symmetrical interpretation is not meta-linguistic. Assuming Fodor's (1983) 'Modularity Thesis', the mechanism in question would seem to belong to a semantic/pragmatic subcomponent of the language faculty where syntactic structure is only minimally represented.

The proposal

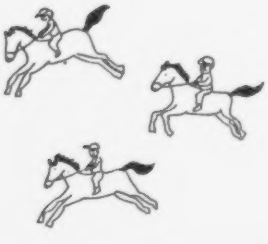
As an introduction to the event quantificational account of the symmetrical interpretation that I will argue for, it is worthwhile considering first the intractability of the phenomenon within the framework of quantification over objects. Consider first a simple Montogovian hypothesis that what the children (and tired adults) are doing is substituting a biconditional for a conditional in their interpretation of the universal quantifier, as shown in (8.a), abstracting away from intensionality. This overcomes the mapping problem of the representation in (2) but, again, like the psychological accounts discussed above, it fails to explain the basic phenomenon as observed under the transitive condition. It is the case that every pony-rider is a boy.

(8) a. $\lambda P \lambda Q\ \forall x\ [P(x) \longleftrightarrow Q(x)]$

b.



c.



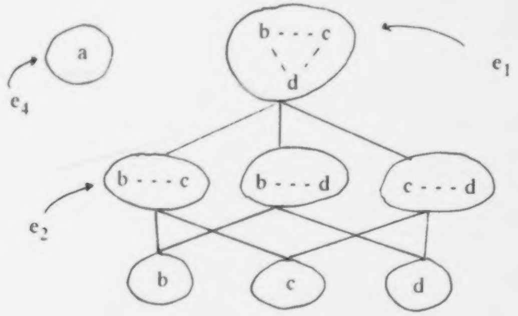
A second conceivable approach is to try to adopt a form of unselective binding (Lewis, 1975; Heim, 1982) to account for the phenomenon, as shown in (8.b). This works for the transitive condition; however, it makes the (absurdly) false[7] prediction that children will reject the picture in (8.c) for the sentence *Every boy is riding a pony*. Nor can things be patched up very easily by quantifying over n-tuples of entities instead of individual entities, as, for instance, in May's (1989) analysis of 'resumptive quantification'. This would simply return us to the problem of falsely predicting a *yes* response under the transitive condition. The lone pony running loose in (1.a) does not obviously constitute, without some additional (crucial) stipulation, one of a set of related entities.

---

[7] Attested by virtually every study in the literature on childrens' use of universal quantifiers.

Bearing these problems in mind, let us now consider the account of symmetrical interpretation I am proposing. It consists of three parts. First is the Event Quantificational Hypothesis, which claims that young children prefer to interpret universal quantification as quantification over events, at least in the case of concrete events. Here it is assumed that truth is evaluated with respect to a mental model derived by perceptual mechanisms (cf. Johnson-Laird, 1983) which may represent not only objects but also events, i.e. sets of related objects. That is, thanks to a very basic, cognitive principle, a set of objects perceived as related in some manner, whether in terms of physical proximity, cause and effect, or some other basic relation, may also be apprehended as a whole, as constituting a particular event or situation. In addition, a single object standing alone may be perceived as constituting an event ('event' subsumes both action and state). I will assume further that any given event may receive an algebraic analysis in terms of the objects that participate in it. Thus, for example, if an event e_1 of type α consists of three objects a, b and c, then it will also have six associated subevents, each one also of type α, as shown in (9). Solid lines in (9) indicate part-whole relations; circles define sets of objects that constitute events.

(9)

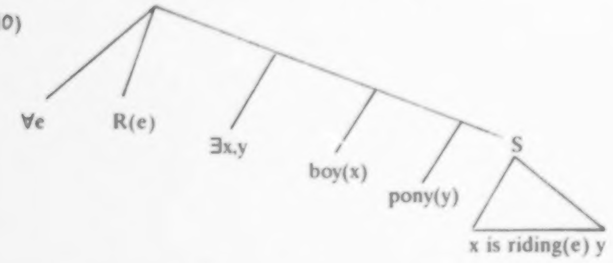


Note that the event associated with the object token a, i.e. e_4, cannot be summed with, say, event e_2 to yield an event consisting of the participants a, b, and c. This is because there is no perceived relation between object a and objects b or d.

Assuming this psychological model, then, the Event Quantificational Hypothesis is the claim that children make use of the innate ability to perceive events to simplify an exhaustive denumeration procedure that is activated by universal quantification. The simplification may consist in part in having less entities to individuate perceptually for the purposes of this denumeration procedure. As already noted, the strategy/option of shifting to event quantification with universal quantifiers is not unique to children; adults too exhibit the symmetrical interpretation. Furthermore, the unmarked interpretation of adult adverbs of quantification seem to call for event quantification (Berman, 1987; de Swart, 1990).

The second part of the proposal is the syntactic claim that children at this age impose a tripartite structure (cf. Heim, 1982; Partee, 1990, 1991) as the logical form they ascribe to a sentence containing a universal quantifier. Ignoring S-structure position, as if matching a template of canonical form, the child obligatorily interprets the quantifier as if it occupied a sentence-initial, adverb-like position (cf. Roeper and de Villiers, 1991), as exemplified in (10) with respect to the sentence *Every boy is riding a pony*.

(10)



Whether the child actually derives an LF fitting this description by means of an application of Move α is not clear. Such an analysis is no doubt compatible with my proposal. The point, though, is that even if there actually is quantifier fronting by a computational mechanism of the syntactic component, it would not be an instance of QR since, crucially, the NP in construction with the quantifier at S-structure is 'left behind'. Consequently, the restrictor, R, in (10), is not defined in the syntactic component.

In so far as there is a kind of primordial, 'anti-compositional' QR at work in the derivation of the logical form in (10) it would seem to be driven not by syntactic principle but rather by an interpretive need. In order for a quantifier to be interpreted it must be 'removed' from its sentential context. Having done this, though, a new interpretive problem arises: how to determine the restriction on the domain of quantification. The third part of my proposal, then, is that the content of R in (10) is supplied by a pragmatic Restrictor Rule that generates as the domain of quantification the set of all maximal events, or maximal subevents of potential events, of the type denoted by the nuclear scope S, as shown in (11).

(11)

$$\llbracket R \rrbracket = \{ e \mid \exists e' [\mathrm{RELEVANT}(e') \ \& \ \llbracket S \rrbracket(e') \ \& \ (e \leq e')] \ \& \ \mathrm{MAX}(e) \}$$

where:

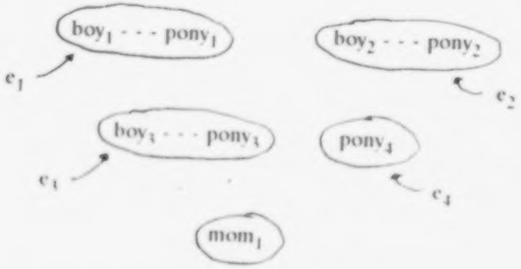
RELEVANT = contextually relevant, i.e. in the field of attention (defined by a picture), whether actually or potentially visible

MAX = maximal event that is actually visible (in a picture), i.e. $\{ e \mid \exists e' [\text{actually}^\wedge\text{visible}'(e') \ \& \ (e \leq e') \dashrightarrow (e = e')] \}$

$$\llbracket S \rrbracket = \{ e \mid \exists x,y [\text{boy}'(x) \ \& \ \text{pony}'(y) \ \& \ \text{ride}'(x,y,e)] \}$$

As a result of restricting the domain of quantification in this manner, the child is compelled to judge the sentence *Every boy is riding a pony* false with respect to the picture in (1.a) because there will be included in the domain of quantification one sub-event of a boy-riding-pony event in which it is not the case that a boy is riding a pony, as shown in the mental model in (12), where $\llbracket R \rrbracket = \{e_1, e_2, e_3, e_4\}$.

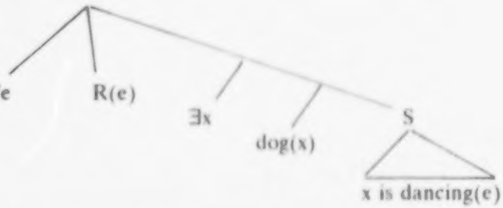
(12)



The falsifying case is event e_4, which has ended up in the restricted domain of the quantifier because it is a maximal subevent of a potential instance of the type of event described by the nuclear scope, but which is falsifying because it does not in fact satisfy the truth conditions stipulated by the nuclear scope.

Having examined the basic manifestation of the phenomenon, i.e. the non-adult-like negative response of the transitive condition, we must next see how the analysis also explains its apparent disappearance under the intransitive and the incorporated conditions discussed in (6) and (7). In the case of the intransitive condition, the inhibition effect is only apparent. The child may still be quantifying over events, but in this case the logical representation he or she entertains happens to be functionally equivalent to that of an adult quantifying over objects, as shown in (13). Hence the appearance of an inhibition of non-adult-like responses. The functional equivalence with adult readings occurs because the Restrictor Rule puts no falsifying case into the restricted domain of quantification when S denotes a set of single-participant events. Such events have no discrete subevents; they are atomic.

(13)



$$[\![R]\!] = \left\{e \mid \exists e' [\![\text{RELEVANT}(e') \ \&\ \text{dog}^\wedge\text{dancing}'(e') \ \&\ (e \leq e')]\!] \ \&\ \text{MAX}(e)\right\}$$

As for the inhibition effect observed with the incorporation condition, this may be explained in terms of an abandonment of quantification over events in the face of a need for a more generic, individual-level reading of the predicate. Following Kratzer (1989), for instance, we may suppose that by their very nature individual-level predicates lack implicit event variables. In this case, insofar as the child is sensitive to the generic quality of the predicate under the incorporated condition, she or he will be unable to quantify over events. The Restrictor Rule will simply never get a chance to apply because event quantification is abandoned all together in favor of adult-like quantification over objects.

This explanation of the phenomenon observed under incorporated condition also sheds some light on how the child is able to outgrow the symmetrical interpretation and eventually attain the adult grammar in which quantification over objects is obligatory for determiner quantifiers like *every*. There is no need to 'un-learn' anything. The child simply shifts from quantification over events to quantification over objects. In this case the Restrictor Rule stands idle. Without quantification over events there is no way for the rule to apply so as to produce the symmetrical interpretation.

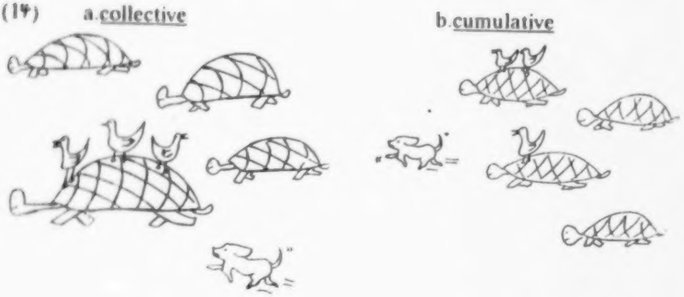
It should also be noted that there is an earlier stage, just after the basic quantificational force of every has been acquired, during which the child quantifies over events but does not appear to have the Restrictor Rule. Instead, the domain of the quantifier is restricted purely in terms of what is taken to be the contextually relevant set, i.e. the set of all objects shown in the picture. A key indication of this earlier stage is rejection of the picture under the transitive condition with reference to the extra, unmentioned agent as justification for this response (e.g. because of the mom in (1.a)).[8]

Predictions

Having accounted for the basic facts of symmetrical interpretation, we may now see how the analysis also offers an explanation of why children at this age have such a strong, non-adult-like insistence on the distributive/wide scope reading of universal quantifiers, especially in the case of *every* and *each*. In addition, we finally find an explanation of a small but recalcitrant fact, first observed by Takahashi (1991), namely the fact that the phenomenon appears to be turned off under control condition 3, as exemplified in (1.d).

Evidence of children's strong preference for a distributive reading of universal quantification is found in their rejection of (14.a) and (14.b) as pictures satisfying the truth conditions of sentences *The birds are all riding a turtle* and *Every bird is riding a turtle* (Drozd and Philip, 1992). For pictures such as (14.a) negative responses were elicited 69% of the time for a group of 36 children. For (14.b) it was 80% of the time with 10 children. In all cases children gave the characteristic symmetrical interpretation response (e.g. *No, because there's no bird on that turtle, that turtle or that turtle*). This is just as predicted.

(14)



a. collective

b. cumulative

Turning to the case of control condition 3, the adult-like response in this case was unexpected and somewhat problematic, not only for the Sum of

---

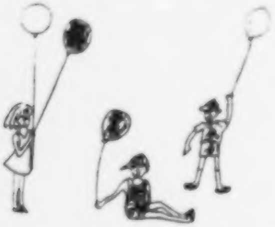
[8] In addition, the younger child fails control 2 exemplified in (1.b), referring to the monkey holding the balloon as the reason for saying *no*. This earlier restriction of the domain of quantification purely in terms of contextual relevance seems non-linguistic.

Plurals account but also for earlier versions of the Restrictor Rule (cf. Philip, 1991a and b). But now this response is predicted since the event of the boy holding an apple in (1.a) will not be put into the restricted domain of quantification by the new Restrictor Rule. It is not a subevent of a real or potential event of the type denoted by the nuclear scope; an event of a boy eating an apple is not be a subevent of a pig eating an apple. Therefore, there is no falsifying case and just as with the intransitive condition the child's logical representation turns out to be functionally equivalent to that of the adult, event though the child is quantifying over events.

Conclusion

We have seen that a series of recalcitrant facts about children's use of universal quantifiers can receive a unified and principled explanation under the proposed analysis. The principal claims are: (i) that children overgeneralize quantification over events or situations, applying it even to determiner quantifiers; (ii) that they lack a compositional means (e.g. QR) of deriving a restriction for the domain of the universal quantifier, and instead make use of a pragmatic mechanism; and (iii) that as a consequence of their non-adult-like treatment of universal quantifiers, children manifest a preference for distributive readings. As regards the notion of a primitive, 'anti-compositional' form of QR, there may be some independent evidence for this hypothesis in the way children at this age handle the quantifier *only* (Crain, Philip, Drozd, Roeper and Matsuoka (in progress)). It seems that children give a single interpretation to a sentence containing *only* regardless of its syntactic position. For example, with respect (15), all three of the sentences on the right are found false of the picture for the same reason, i.e. because a boy has a balloon too. It is as if the children were always fronting *only* to a sentence-adverbial position prior to interpreting it.[9]

(15)



Only the girl has a red balloon
The girl only has a red balloon
The girl has only a red balloon

---

[9] And interpreted it as 'living on' the subject NP

Whether or not the children's linguistic behavior is evidence that in the absence of QR they are nonetheless fronting quantifiers to A-bar positions, by means of a kind of incipient QR, it seems clear that their derivation of logical form is semantically driven. Extracting a quantifier from a sentence satisfies an interpretive need; it serves a semantic function. It is not the side effect of some gradually maturing innate compulsion to restructure linguistic representations.[10] Similarly, the need to find a restriction for the domain of quantification is also an interpretive need. In the absence of QR some other mechanism is seen to arise in order to satisfy this need. In this sense the Restrictor Rule looks like a form of accommodation. The child knows that universal quantifier calls for some sort of restriction to the domain of quantification; the problem is how to 'accommodate' this need.[11] Alternatively, viewed from phylogenetic perspective, we might wonder if QR itself were not the grammaticization of a rule of accommodation. In any case, it is interesting to note that the Restrictor Rule conforms to Subset Principle, albeit in a purely semantic domain.

References

Barwise, J. and R. Cooper 1981. 'Generalized quantifiers and natural language,' *Linguistics and Philosophy*, 4, 159-219.

Barwise, J. and J. Perry 1983. *Situations and Attitudes*, MIT Press, Cambridge, MA.

Berman, S. 1987. 'Situation based semantics for adverbs of quantification,' in J.Blevins and A. Vainikka (eds.), *University of Massachusetts Occasional Papers in Linguistics*, 12, Graduate Linguistics Student Association, Linguistics Department/UMass, Amherst, MA.

Berwick, R.C. 1985. *The Acquisition of Syntactic Knowledge*, MIT Press, Cambridge, MA.

Boswell, S.L. 1976. 'Young children's processing of asymmetrical and symmetrical patterns,' *Journal of Experimental Child Psychology*, 22, 309-318.

Braine, M.D.S. and B. Rumian 1983. 'Logical reasoning,' in John H. Flavell and Ellen M. Markman (eds.), *Handbook of Child Psychology*, vol.3, John Wiley and Sons, New York, 266-340.

---

[10] In light of the arguments of Pinker and Bloom (1990), it seems extremely unlikely that any major mechanisms of the language faculty are functionless.

[11] '[The child] derives from the language a general notion of the theme---of the elements involved and the *kinds* of relation that are referred to ...but linguistic considerations alone leave open to [the child] certain options' (Donaldson and Lloyd, 1974: 82)

Bucci, W. 1978. 'The interpretation of universal affirmative propositions,' *Cognition*, 6, 55-77.

Chien, Y. and K Wexler 1989. 'Children's knowledge of relative scope in Chinese,' *Stanford Child Language Research Forum*, Stanford University, Stanford, CA.

Crain, S., W. Philip, K. Drozd, T. Roeper and K. Matsuoka (in progress). 'Only in child grammar.'

Davidson, D. 1966. 'The logical form of action sentences,' in N. Rescher (ed.), *The Logic of Decision and Action*, University of Pittsburgh Press, Pittsburgh, PA, 81-103.

de Swart, H. 1991. *Adverbs of Quantification: A Generalized Quantifier Approach* (diss.).

Donaldson, M. and P. Lloyd 1974. 'Sentences and situations: children's judgments of match and mismatch,' in F. Bresson (ed.), *Problèmes Actuels en Psycholinguistique*, Centre National de la Recherche Scientifique, Paris, 73-86.

Donaldson, M. and J. McGarrigle 1973. 'Some clues to the nature of semantic development,' *Journal of Child Language*,1,185-94.

Drozd, K. and W. Philip 1992. 'Event quantification in preschoolers' comprehension of negation,' paper presented at 24th Annual Child Language Research Forum, Stanford Univ.

Fodor, J.A. 1983. *Modularity of Mind*, MIT Press, Cambridge, MA.

Gil, D. 1982. 'Quantifier scope, linguistic variation, and natural language semantics,' *Linguistics and Philosophy*, 5, 421-472.

Heim, Irene. 1982. *Semantics of Definite and Indefinite NP*. Ph.D dissertation, University of Massachusetts, reproduced by Graduate Linguistics Student Association, Linguistics Department, University of Massachusetts, Amherst, MA.

Higginbotham, J. 1983. 'The logical form of perceptual reports', *Journal of Philosophy*, 80, 100-127.

Inhelder, B. and J. Piaget 1964. *Early Growth of Logic in Child*. Routledge and Kegan Paul, London.

Johnson-Laird, P.N. 1983. *Mental Models: Towards A Cognitive Science of Language, Inference, and Consciousness*. Harvard University Press, Cambridge, MA.

Kempson, R. M. and A. Cormack 1981. 'Ambiguity and quantification,' *Linguistics and Philosophy*, 4, 259-309.

Kobuchi, M and W. Philip 1990. 'Quantifier Spreading and Minna' (ms.) Linguistics Department, UMass, Amherst, MA.

Kratzer, A. 1989. 'Stage-level and individual-level predicates,' *Papers on Quantification*, reproduced by Graduate Linguistics Student Association, Linguistics Dept/UMass, Amherst, MA.

Langendoen, D.T. 1978. 'The logic of reciprocity,' *Linguistic Inquiry*, 9,2, 177-197.

Lee, T. H-T. 1986. 'Acquisition of quantificational scope in Mandarin Chinese,' UCLA (diss.).

Lewis, D. 1975. 'Adverbs of quantification,' in E.L.Keenan (ed.), *Formal Semantics of Natural Language*, Cambridge University Press, Cambridge, 3-15.

Lewis, D. 1979. 'Score keeping in a language game,' *Journal of Philosophical Logic*, 8, 339-359.

Macnamara, J. 1982. *Names For Things: A Study of Human Learning*, MIT Press, Cambridge, MA.

Macnamara, J. 1986. *A Border Dispute: the Place of Logic in Psychology*, MIT Press, Cambridge, MA.

Maxfield, T. and B. Plunkett (eds.) 1991. *University of Massachusetts Occasional Papers in Linguistics: Special Edition, Papers in the Acquisition of WH: Proceedings of the UMass Roundtable, May, 1990*, Graduate Linguistics Students Association, Linguistics Department/UMass, Amherst, MA.

May, R. 1977. *The Grammar of Quantification*. MIT PhD Thesis, reproduced by the Indiana University Linguistics Club.

May, R. 1985. *Logical Form: Its Structure and Derivation*.

May, R. 1989. 'Interpreting logical form,' *Linguistics and Philosophy* 12,4, pp. 387-436.

Mehler, J. and P. Carey 1976. 'Role of surface and base structure in the perception of sentences,' *Journal of Verbal Learning and Verbal Behavior*, 6, pp. 335-338.

Miyamoto, Y. 1992. 'The collective and distributive interpretation in child grammar,'(ms).

Miyamoto, Y. and S. Crain 1991. 'Children's interpretation of plural pronouns: collective vs distributive interpretation,' paper presented at *Sixteenth Annual Boston University Conference on Language Development, October 1991*.

Partee, B. 1990. 'Quantification and some questions for semantic typology,' (ms).

Partee, B. 1991. 'Topic, focus and quantification,' *Proceedings from Semantics and Linguistic Theory I, Cornell Working Papers in Linguistics*, 10, 159-187.

Partee, B. and M. Rooth 1983. 'Generalized conjunction and type ambiguity,' in R. Bauerle, C. Schwarze and A. von Stechow's (eds.) *Meaning, Use, and Interpretation of Language*, Walter de Gruyter: New York, 361-383.

Parsons, T. 1990. *Events in the Semantics of English: A Study in Subatomic Semantics*, MIT Press, Cambridge, MA.

Philip, W. 1991a. 'Spreading in the acquisition of universal quantifiers.' *Proceedings of the Tenth West Coast Conference on Formal Linguistics*, Stanford Linguistics Association, Stanford, CA, 359-373.

Philip, W. 1991b. 'Symmetrical interpretation with ditransitives,' paper presented at *Sixteenth Annual Boston University Conference on Language Development, October 1991*, (ms.).

Philip, W. (to appear) 'Event quantification and the symmetrical interpretation of universal quantifiers in child language,' in K. von Fintel and H.Rullman's (eds.) *University of Massachusetts Occasional Papers in Linguistics: Semantic Issues* (forthcoming), Graduate Linguistics Students Association, Linguistics Department/UMass, Amherst, MA.

Philip, W. and S. Aurelio 1991. 'Quantifier spreading: pilot study of preschooler's every,' Maxfield and Plunkett (1991), 267-82.

Philip, W. and M. Takahashi 1991. 'Quantififer spreading in the acquisition of every,' Maxfield and Plunkett (1991), 283-301.

Pinker, S. and P. Bloom 1990. 'Natural language and natural selection,' *Behavioral and Brain Sciences*, 13, 707-784.

Revlin, R. and V.O. Leirer 1978. 'The effects of personal biases on syllogistic reasoning: rational decisions from personalized representation,' in R.Revlin and R.Mayer (eds.), *Human Reasoning*, Winston, Washington, D.C.,51-81.

Revlin, R. and V.O. Leirer 1980. 'Understanding quantified categorical expressions,' *Memory and Cognition*,8,5, 447-458.

Revlis, R. 1975. 'Formal syllogistic reasoning: logical decisions from a complex data base,' in R. Falmagne (ed.), *Reasoning: representation and process in childrn and adults*, Erlbaum, Hillsdale, NJ.

Roeper, T. and J. deVilliers. 1991. 'The emergence of bound variable structures,' Maxfield and Plunkett (1991), 225-265.

Rooth, M. 1985. *Association with Focus*, Ph.D dissertation, University of Massachusetts, reproduced by Graduate Linguistics Student Association, Linguistics Department, UMass, Amherst, MA.

Stalnaker, R.C. 1978. 'Assertion,' *Syntax and Semantics*, 9, 315-332.

On Telescoping

Massimo Poesio
University of Rochester

Alessandro Zucchi
Stanford University

1 The Problem

The phenomenon we discuss is illustrated by the contrast in (1)-(8) (we use coindexing to indicate intuitive binding):

(1) ??Every dog$_i$ came in. It$_i$ lay down under the table.

(2) *If every cat$_i$ purrs, it$_i$ is happy.

(3) *If John owes every man$_i$ money then Sam pays him$_i$. [Hornstein, 1984]

(4) *John likes every dog$_i$ and Sam feeds it$_i$. [Hornstein, 1984]

(5) Every story$_i$ pleases these children. If it$_i$ is about animals, they are excited, if it$_i$ is about witches, they are enchanted, and if it$_i$ is about humans, they never want me to stop. [Belvadi, 1989]

(6) Each degree candidate$_i$ walked to the stage. He$_i$ took his diploma from the dean and returned to his$_i$ seat. (Partee, from [Roberts, 1987])

(7) Each student$_i$ in the syntax class was accused of cheating on the exam and he$_i$ was reprimanded by the dean. [Fodor and Sag, 1982]

(8) Each candidate$_i$ for the space mission meets all our requirements. He$_i$ has a Ph.D. in Astrophysics and extensive prior flight experience. [Roberts, 1987]

Data of the type in (1)-(4) led Heim ([Heim, 1982], p.204) to assume the *Scope Constraint*: quantifiers cannot take scope beyond the clause in which they appear at S-structure. Yet, (5)-(8) involve an occurrence of a singular pronoun which is in some sense anaphorically related to a universal quantifier in the previous sentence. Roberts [1987] called this phenomenon *telescoping*.

2 DRT, DMG, and Telescoping

In the Kamp/Heim approach, (i) quantifiers are unable to bind variables outside their scope at S-structure, (ii) indefinite NP's have no quantificational power of their own, and (iii) provisions for default existential quantification of free variables account for the ability of indefinites to be anaphorically related to pronouns outside their scope. In this approach, the intuitive bindings in

(1)-(4) are correctly ruled out by (i). The data in (5)-(8), on the other hand, are unaccounted for.

In Groenendjik and Stokhof's Dynamic Montague Grammar (DMG), indefinites are existential quantifiers. Their ability to enter in anaphoric relations with pronouns outside their scope is accounted for by assuming that existential quantifiers are able to bind variables outside their scope. This means that (i) is false in DMG. Thus, (5)-(8) are naturally analyzed in DMG as instances of variable binding. For example, using the dynamic version of the universal quantifier, (9) would be translated as (10), which is equivalent to (11).

(9) Each degree$_i$ candidate walked to the stage. He$_i$ took his$_i$ diploma from the dean.

(10) $\mathcal{A}d_i$[`degree-candidate`(d_i) $\Rightarrow$ `walked-to-the-stage`(d_i)];
`took-his-diploma-from-the-dean`(d_i)

(11) $\mathcal{A}d_i$[`degree-candidate`(d_i) $\Rightarrow$ [`walked-to-the-stage`(d_i);
`took-his-diploma-from-the-dean`(d_i)]]

In this analysis, however, (1)-(4) are problematic, since we might expect the universal quantifier to be able to bind the pronoun.

3 Towards an Account of Telescoping

What we want to do at this point is to present the main features of the account of telescoping we have in mind, so that you know where we are heading. Then, we'll pursue various aspects of the account in more detail.

Roberts [1989] suggested an analysis of the data in (5)-(8) which is compatible with the scope constraint. In this analysis, for example, (6) undergoes an accommodation process whose outcome is that the second sentence in (6) is represented as a tripartite structure whose restrictor has been reconstructed as in (12′):

(12) He$_i$ took his diploma from the dean and returned to his$_i$ seat.

(12′) $\boxed{\begin{array}{l} x \\ \text{DEGREE-CANDIDATE}(x) \end{array}} \longrightarrow \boxed{\begin{array}{l} \\ \text{TOOK-HIS-DIPLOMA-FROM}(x, d) \\ \ldots \end{array}}$

However, neither Roberts nor Groenendjik and Stokhof address in a systematic way why the contrast in (1)-(8) arises. We will argue that the analysis of telescoping in terms of Roberts' restrictor reconstruction approach is preferable to the variable binding approach. We suggest that reconstruction of the restrictor is subject to the following necessary licensing condition:

Licensing Condition for Restrictor Reconstruction

> Given a sentence S, reconstruction of a restrictor for S is possible only if the discourse makes it clear that S is to be interpreted relative to a restrictor.

The task we face in suggesting this condition is obviously that of explaining what "make clear" means. We suggest that there are two basic ways in which the discourse can make it clear that S is to be interpreted relative to a restrictor. One way, which Roberts also pointed out, is given in A:

A. The discourse can make it clear that a sentence S is to be interpreted relative to a restrictor by explicitly indicating via syntactic means the presence of an operator which takes a restrictor and a nuclear scope.

For example, the presence of an if-then structure is an explicit indication of the presence of a restrictor. Thus, (5) is an instance of A:

(5) Every story$_i$ pleases these children. If it$_i$ is about animals, they are excited, if it$_i$ is about witches, they are enchanted, and if it$_i$ is about humans, they never want me to stop. (Belvadi)

Assuming that the generic operator is an operator on tripartite structures (see, e.g., [Heim, 1982; Carlson, 1987; Krifka, 1992]) instances of telescoping with generic sentences like (13) also fall under A. The constrast in (14), pointed out to us by Geoff Nunberg, shows again how the possibility of a generic reading, licensed by the bare NP "ostracism" in (14a), licenses telescoping.

(13) Every Italian$_i$ loves his$_i$ mother. He$_i$ adores her.

(14) a. Every male Athenian citizen$_i$ voted on ostracism. He wrote the name of the candidate on a piece of pottery.

b. Every male Athenian citizen$_i$ voted on the ostracism. ??He wrote the name of the candidate on a piece of pottery.

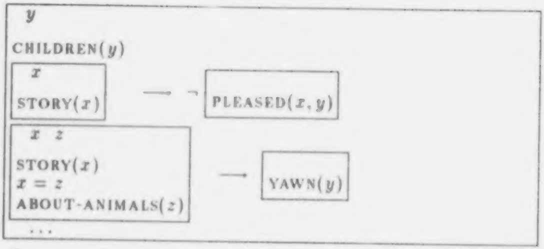
(15) is also an instance of A:

(15) No story$_i$ pleases these children. If it$_i$ is about animals they yawn, if it$_i$ is about witches they frown. If it$_i$ is about people they fall asleep.

Assuming that downward monotonic quantifiers like 'no' can be represented in DRT as in (16), the accommodation of the missing antecedent would yield representation (15′), which assigns correct truth-conditions to (15):

(16) $\boxed{\begin{array}{c} x \\ \mathbf{P}(x) \end{array}} \longrightarrow \neg \boxed{\mathbf{Q}(x)}$

(15′)



The other way in which the discourse can make it clear that S is to be interpreted relative to a restrictor is B:

B. The discourse can make it clear that a sentence S is to be interpreted relative to a restrictor by providing contextual information which links S to a restrictor.

In order to illustrate the meaning of B, let's observe that by making it clear that the events described are part of a script in which every member of a contextually-given group instantiates a certain property, telescoping becomes possible even when at first sight it was not. Consider (1) again:

(1) ??Every dog$_i$ came in. It$_i$ lay down under the table.

Now, read (1) in the context provided by (17):

(17) I went to the circus last night. They had a number involving dogs that went like this: The circus performers put a table on some supports. Then, every dog came in. It lay down under the table, stood on its back paws, and lifted the table with its front paws.

In this context, (1) becomes marginally acceptable. In cases such as the sequence of events described by (6), the script may be already known to the reader: it is common knowledge that in graduation ceremonies a certain routine is performed by all degree candidates. We suggest that it is this contextually-given knowledge that makes it possible to recover a restrictor for the telescoped sentence:

> A context c may link S to a restrictor $[\alpha]$ only if $[\alpha] \Rightarrow S$ is a step of a script salient in c.

Notice that looking at telescoping as restrictor reconstruction leads one to expect that telescoping of a pronoun in a simple sentence should be subject to a constraint of the type above. If the presence of a restrictor for S is not explicitly indicated by the syntax, the tripartite structure itself needs to be reconstructed together with an appropriate content for the restrictor. And it seems plausible to assume that structure-building operations of this sort at the discourse level are allowed only when the context gives a very clear indication that the simple sentence is to be interpreted relative to a restrictor. On the other hand, the variable binding approach yields no account of why telescoping of a pronoun in a simple sentence should be constrained as it is, since, in this approach, whether the pronoun occurs in a tripartite structure or not makes no difference to the ability of the universal quantifier in the previous sentence to bind the pronoun.

This concludes the intuitive sketch of the proposal. Now, we turn to pursuing it in more detail. First, we discuss the instances of telescoping in which the presence of a restrictor is syntactically signalled, and then those instances of telescoping that involve reconstructing the structure.

4 Reconstructing the Content of the Restrictor

The Nature of the Reconstruction Process

There are different ways in which one might think of the process of reconstructing the content of the restrictor in telescoping examples like (5):

(5) Every story$_i$ pleased the children. If it$_i$ was about animals, they were excited, if it$_i$ was about witches, they were enchanted, and if it$_i$ was about humans, they never wanted me to stop.

One way is to look at it as a purely pragmatic process in which contextually salient material is inserted into the restrictor. In this purely pragmatic approach,

(i) considerations of plausibility and consistency may determine what gets filled in the restrictor;

(ii) what material gets accommodated in the restrictor is not constrained by the semantic structure of the preceding discourse, unless this structure can be maintained to affect the saliency of the descriptive material considered for accommodation;

(iii) no formal relation is assumed between the telescoped pronoun and the NP to which the pronoun is intuitively related.

But views of the reconstruction process which do not assume (i)-(iii) are also possible. For example, one could reject (iii) and maintain that

(iv) the pronoun and its intuitive antecedent are formally related, but this formal relation is not semantically realized as variable binding.

(One needs to add the "but" if (iv) is not to be collapsed with the variable binding view.) Or one might reject (ii) and claim that

(v) the semantic structure of the preceding discourse plays a role beyond affecting saliency in constraining accommodation.

Mixed views are also possible. One could maintain (iv) or (v) and make room for (i) as well. Which view is correct?

In the examples of telescoping considered so far, in which the tripartite structure is explicitly indicated, the accommodated material seems to come from the universally quantified NP which we intuitively perceive as the antecedent of the pronoun (AR = intuitively accommodated restrictor):

(5) Every story$_i$ pleases these children. If it$_i$ is about animals, they are excited, if it$_i$ is about witches, they are enchanted, and if it$_i$ is about humans, they never want me to stop.
AR: [x is a story]

(13) Every Italian$_i$ loves his$_i$ mother. He$_i$ adores her.
AR: [x is an Italian]

(15) No story$_i$ pleases these children. If it$_i$ is about animals they yawn, if it$_i$ is about witches they frown. If it$_i$ is about people they fall asleep.
AR: [x is a story]

But this is no evidence that telescoping requires us to assume that there is a formal relation of some sort between the telescoped pronoun and the universally quantified NP. For example, the fact that only material from the NP is borrowed in (15) may follow from the fact that the first sentence in the discourse has already made clear that the set of stories that please these children is empty. Thus, if we accommodated the antecedent "x is a story that pleases these children" in the second sentence, the conditional would become trivial. For (5), on the other hand, accommodating material from the NP and from the VP rather than from the NP alone would not result in different truth-conditions for the discourse as a whole, since by the time the second sentence is processed, the common ground already contains the information that the set of stories is identical to the set of stories that please these children. A purely pragmatic version of the antecedent reconstruction process, therefore, seems to work fine for the examples of telescoping we have considered so far. Considerations of plausibility dictate what gets filled in the antecedent. Consider, however, examples (18)-(20):

(18) Not every paper$_i$ is written in Italian. If it$_i$ is submitted to an English journal, the editors don't like it$_i$.

(19) Not every paper$_i$ that gets submitted to a journal is a good paper. If it$_i$ is accepted, it$_i$'s a good paper.

(20) Not every paper$_i$ assumes dialectical materialism. If it$_i$ is read at an international conference, the audience doesn't like it$_i$.

Consider sentence (19). In this case, the understood interpretation for the pronoun is "x is a paper submitted to a journal" rather than "x is a paper submitted to a journal which is a good paper." The pragmatic account of telescoping makes the correct prediction in this case, since the second sentence would become trivial if we copied "x is a paper submitted to a journal which is good paper" into the antecedent box of the second sentence. Consider (18), however. Here, plausibility suggests the antecedent of the telescoped sentence should be filled with "x is a paper written in Italian," since if we copy "x is a paper," we would get a very implausible reading, namely the reading that "if a paper is submitted to an English journal, the editors don't like it." Thus, the pragmatic story predicts that we should understand (18) as saying what (21) says. In fact, (18) cannot get reading (21). English speakers find (18) bad since the only reading available, given in (22), doesn't make much sense.

(21) Not every paper is written in Italian. If x is a paper written in Italian and x is submitted to an English journal, the editors don't like it.

(22) Not every paper is written in Italian. If x is a paper and x is submitted to an English journal, the editors don't like it.

Example (20) makes the same point as (18). Notice, moreover, that the inability of the reconstruction process to collect material from the VP cannot be attributed to the fact that material in the VP is inaccessible for telescoping, since (23) is an acceptable instance of telescoping:

(23) These children like every story$_i$. If it$_i$ is about animals, they are excited, if it$_i$ is about witches, they are enchanted, and if it$_i$ is about humans, they never want me to stop.

What the data in (18)-(23) point at is that a purely pragmatic account of accommodation won't do for telescoping. But what is the full moral we should draw from (18)-(23)?

A Constraint on Accomodation

We suggest C1 as a constraint on accommodation:

C1 *If a discourse marker x is accommodated in a restrictor r, only descriptive material in the minimal box whose universe contains x can be accommodated in r.*

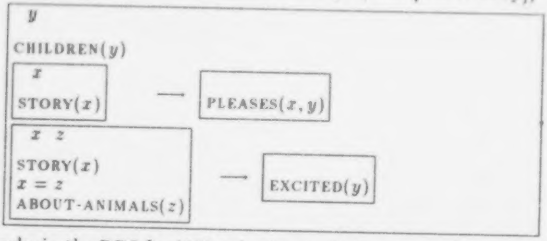
We also assume that accommodation follows P1:

P1 *Accommodate descriptive material from the minimal box containing the accommodated discourse marker up to inconsistency or implausibility*

Let us now return to the instances of telescoping in (5), (13), (15), (18)-(20). The constraints we proposed yield the correct choice of restrictors for these cases. Take (5), for example: the discourse referent accommodated in the corresponding DRS (5') is x, and the only descriptive material in the box whose universe contains x is STORY(x), which is the intuitively correct choice of restrictor (AR = intuitively accommodated restrictor):

(5) Every story$_i$ pleases these children. If it$_i$ is about animals, they are excited, if it$_i$ is about witches, they are enchanted, and if it$_i$ is about humans, they never want me to stop. (AR: [x is a story])

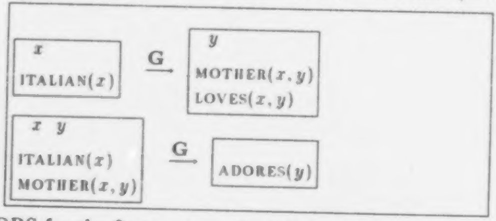
(5′)


y
CHILDREN(y)
x
STORY(x)
PLEASES(x, y)
x z
STORY(x)
x = z
ABOUT-ANIMALS(z)
EXCITED(y)

Similarly, in the DRS for (13) only the condition ITALIAN(x) can be accommodated for x. The descriptive material accommodated for y is MOTHER(x, y). We don't need to accommodate LOVES(x, y) since the first sentence in the discourse has already told us that every Italian loves his mother.

(13) Every Italian$_i$ loves his$_i$ mother. He$_i$ adores her. (AR: [x is an Italian])

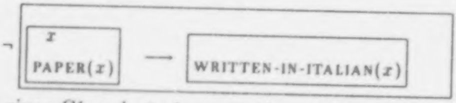
(13′)


x
ITALIAN(x)
G
y
MOTHER(x, y)
LOVES(x, y)
x y
ITALIAN(x)
MOTHER(x, y)
G
ADORES(y)

The DRS for the first sentence in (18) is (24):

(18) Not every paper$_i$ is written in Italian. If it$_i$ is submitted to an English journal, the editors don't like it$_i$. (AR: [x is a paper])

(24)


¬
x
PAPER(x)
WRITTEN-IN-ITALIAN(x)

Thus, given C1, only "x is a paper" could be accommodated. However, this would result in an implausible reading of (18). A similar prediction is made for (19). The first sentence in (19) gets represented as (25):

(19) Not every paper$_i$ that gets submitted to a journal is a good paper. If it$_i$ is accepted, it$_i$'s a good paper. (AR: [x is a paper])

$$(25)\quad \neg\boxed{\begin{array}{l}\boxed{\begin{array}{l} x\ \ y \\ \text{PAPER}(x)\\ \text{JOURNAL}(y)\\ \text{SUBMITTED}(x,y)\end{array}} \longrightarrow \boxed{\text{GOOD-PAPER}(x)}\end{array}}$$

Given the constraints above, the whole descriptive material of the antecedent DRS is accommodated in the restrictor of the second sentence. Finally, in the case of (15), the choice of the structure $K_1 \Rightarrow\sim K_2$ for the first sentence in (15) yields representation (15′) in which the accommodated material is STORY(x), since this is the only material in the minimal box containing x.

(15) No story$_i$ pleases these children. If it$_i$ is about animals they yawn, if it$_i$ is about witches they frown. If it$_i$ is about people they fall asleep.
AR: [x is a story]

$$(15')\quad \boxed{\begin{array}{l} y \\ \text{CHILDREN}(y) \\ \boxed{\begin{array}{l} x \\ \text{STORY}(x)\end{array}} \longrightarrow \neg\boxed{\text{PLEASED}(x,y)} \\ \boxed{\begin{array}{l} x\ \ z \\ \text{STORY}(x)\\ x = z\\ \text{ABOUT-ANIMALS}(z)\end{array}} \longrightarrow \boxed{\text{YAWN}(y)} \\ \ldots \end{array}}$$

Moreover, choosing a representation of the form $\sim K$ for the first sentence in (15), as in (26),

$$(26)\quad \boxed{\begin{array}{l} y \\ \text{CHILDREN}(y) \\ \neg\boxed{\begin{array}{l} x \\ \text{STORY}(x)\\ \text{PLEASES}(x,y)\end{array}} \end{array}}$$

would still result in the same choice of STORY(x) as the accommodated restrictor, because accommodating PLEASES(x,y) in addition to STORY(x) would make the conditional structure for the second sentence trivial, since the discourse has already informed us that there is no story that pleases these children. (Accommodating only PLEASES(x,y) would make the conditional implausible since the property predicated of the "it" indicates that "it" refers to "stories.")

The constraints above also predict the correct choice of a restrictor for Roberts' example of modal subordination in (13):

(13) A$_i$ wolf might come in. It$_i$ would eat you first.
AR: x is a wolf that comes in

In this case, the DRS for the first sentence in (13) is (27):

(27) $$\Diamond \boxed{\begin{array}{l} \quad x \\ \hline \text{WOLF}(x) \\ \text{COMES-IN}(x) \end{array}}$$

Thus, all of the descriptive material of the DRS under the scope of the diamond would be carried along. Finally, the constraints above predict the correct choice of a restrictor for the second sentence in (28) (pointed out to us by Makoto Kanazawa):

(28) No man$_i$ can be friends with a woman$_j$ he$_i$ finds attractive. He$_i$ always wants to have sex with her$_j$. (from "When Harry met Sally")

In (28) the understood antecedent for the second sentence is (29) and not (30):

(29) if x is a man and y is a woman x finds attractive

(30) if x is a man and y is a woman x finds attractive and y is a woman x is friends with

In this case, what prevents the choice of antecedent (30) is that the discourse prior to the utterance of the second sentence in (28) has made it clear that there are no men that can be friends with a woman they find attractive and thus the choice of the antecedent in (29) would result in trivializing the conditional.

According to our proposal then, at least (i) and (v) are needed in order to account for how the accommodation process works:

(i) considerations of plausibility and consistency may determine what gets filled in the restrictor;

(v) the semantic structure of the preceding discourse plays a role in constraining accommodation beyond affecting saliency.

We are not suggesting that C1 and P1 are the only constraints on accommodation. But, in view of the cases we have considered, it seems to us that a purely pragmatic approach is unlikely to yield the correct range of interpretations. At least something like C1 and P1 are needed.

5 The Variable Binding Approach

At this point, you may want to come back to the bound variable approach and see whether it does any better than the accommodation approach. Let's consider Roberts's modal subordination first.

Roberts [1987; 1989] noticed that discourses of the type in (31a) are problematic for DRT, since the reference marker introduced by the indefinite is not accessible to the pronoun "it" (under the interpretation consistent with there being no wolf around). Roberts argued that (31a) cannot be plausibly treated by assuming that the second sentence in (31a) is brought under the scope of the possibility operator as in (31b), since this would assign incorrect truth-conditions to (31a), i.e. it would predict that (31a) is synonymous with (31c).

(31) a. A$_i$ wolf might come in. It$_i$ would eat you first.

b. $\Diamond \boxed{\begin{array}{l} \quad x \\ \text{WOLF}(x) \\ \text{COME-IN}(x) \\ \text{EAT-YOU-FIRST}(x) \end{array}}$

c. A$_i$ wolf might come in and eat you first.

One might object that this is not a conclusive argument against treating (31a) as a case of insertion (and thus of variable binding) as in (31b) since in (31b) we have simply ignored the modal "would". One might argue that if we don't ignore the "would", it is possible to assume that the pronoun is a bound variable and obtain correct truth-conditions. In DRT this would amount to assuming DRS (32) in place of (31b):

$$(32)\quad \Diamond \boxed{\begin{array}{l} \quad x \\ \text{WOLF}(x) \\ \text{COME-IN}(x) \\ \Box \boxed{\text{EAT-YOU-FIRST}(x)} \end{array}}$$

Groenendijk and Stokhof [1990] could generate an equivalent formula by assuming that the possibility operator can extend its scope over the second sentence in (31a). In fact, we think there is some evidence in support of Roberts's contention that (31a) is not an instance of variable binding. Consider (33):

(33) a. A marmot may be inside. It would bite your hand.

b. It may be the case that a marmot is inside and would bite your hand.

Contrast (33) shows that the interpretation of the sentence in which the "would" is under the scope of a possibility operator differs from the interpretation of the corresponding sentence in which the "would" is not . Intuitively, under the epistemic reading of the possibility operator, the necessity operator requires an epistemic reading in (33b), but not in (33a). The difference may be seen clearly in (34), where it is explicitly indicated that the possibility operator should be understood epistemically:

(34) a. In view of what I believe, a marmot may be inside. It would bite your hand.

b. In view of what I believe, it may be the case that a marmot is inside and would bite your hand.

Thus, the revised version of the insertion approach still fails to get the truth-conditions right. This suggests that Roberts's missing antecedent approach is preferable: in this approach, the modal base of "would" may be fixed independently of the modal base of the possibility operator, since "would" is not in the scope of the possibility operator. Another way of putting the problem for the insertion approach is that although (35) is a theorem of S5,

(35) $\Diamond\Box q \rightarrow \Box q$

once we allow for different modal bases for "would" and "might," we are no longer in a position to derive "A wolf that came in would eat you first" from DRS in (32).

Now, let's return to the example of telescoping involving "no":

(15) No story$_i$ pleases these children. If it$_i$ is about animals they yawn, if it$_i$ is about witches they frown. If it$_i$ is about people they fall asleep.

Recall that Dynamic Quantifiers are capable of binding variables outside their scope and that dynamic operators do not freeze dynamic effects of formulae in their scope. To avoid predicting that the negation hidden in the meaning of the subject NP "no story" takes scope over the second sentence in (15), Groenendijk and Stokhof suggest that the choice of a translation for quantifiers is constrained by the following *monotonicity constraint*:

MC $\downarrow[\Phi;\Psi] \models \downarrow\Phi$

The constraint requires that "for any proper translation of a sentence Φ at the discourse level, it should hold that the truth-conditional content of Φ continued with Ψ is at least as strong as Φ itself." The intuitive motivation for the constraint is that in this way we require that

MC (English) no step in a discourse can constitute a weakening of the truth conditional content of the discourse up to that point

Intuitively, **MC** prevents negation in (15) from taking scope over the second sentence since this would result in the discourse being weaker than the first sentence. The monotonicity constraint proposed by Groenendijk and Stokhof is effective in requiring a choice of translation of the type in (36) for 'no' in (15):

(36) $\lambda P \lambda Q \mathcal{A} d_i[{}^\wedge P(d_i) \Rightarrow \uparrow\downarrow\sim{}^\wedge Q(d_i)]$

In this case, negation is prevented from taking scope over the second sentence in the discourse by the down arrow (assuming ~ is dynamic negation, ↑↓~ is its static counterpart.) The result is that discourse (15) is assigned a translation of the form in (37):

(37) $\mathcal{A}d_i[P \Rightarrow \uparrow\downarrow{\sim}{}^{\wedge}Q]; R$

The dynamic universal is able to bind the pronoun in the second sentence of the discourse, without generating incorrect truth-conditions. Consider however, example (28) again:

(28) No man$_i$ can be friends with a woman$_j$ he$_i$ finds attractive. He$_i$ always wants to have sex with her$_j$.

The indefinite "a woman he finds attractive" is translated as an existential by Groenendijk and Stokhof. If we adopt a translation of the type in (37), however, negation closes the existentially quantified formula and prevents "a woman" from anaphorically binding the pronoun "her" in the second sentence of the discourse. On the other hand, if we do not close negation off and we also assume that implication is dynamic in order to allow the existential "a woman" to bind the pronoun "her," then we predict incorrectly that (28) should have reading (38):

(38) if x is a man then it's not the case that (there is a y such that y is a woman that x finds attractive and y can be friends with x and x always wants to have sex with y.)

Thus, while the accommodation approach runs into the problem of explaining why accommodation happens in the way it does, the variable binding approach runs into an even more radical problem: it's hard to see how the correct truth-conditions for the telescoping cases and for the modal subordination cases could be derived in Groenendjik and Stokhof's DMG.[1] Finally, as we observed before, the variable binding approach yields no account of why telescoping of a pronoun in a simple sentence S should be limited to cases in which contextual information linking S to a restrictor is present.

We will now consider the cases of telescoping in sentences without explicit tripartite structures.

6 Telescoping Without Explicit Tripartite Structures

Scripts and Telescoping

Consider again the contrast between (6) (repeated as (39a)) and (1) (repeated as (39b)). The most obvious difference between the two sentences is that two different determiners are used— "every" is used in (39a), whereas "each" is used in (39b). But (39c) is not significantly better than (39b). We have seen, on the other hand, that when (39b) is read in the context provided by (40), (39b) becomes marginally acceptable.

---

[1] Dekker's [1990] revision of DMG assigns correct truth conditions to (28) by raising once more the type of the translation of sentences and redefining dynamic negation. An evaluation of Dekker's system requires more space than we have available.

(39) a. Each degree candidate$_i$ walked to the stage. He$_i$ took his diploma from the dean and returned to his$_i$ seat.

b. ??Every dog$_i$ came in. It$_i$ lay down under the table.

c. ??Each dog$_i$ came in. It$_i$ lay down under the table.

(40) I went to the circus last night. They had a number involving dogs that went like this: The circus performers put a table on some supports. Then, every dog came in. It lay down under the table, stood on its back paws, and lifted the table with its front paws.

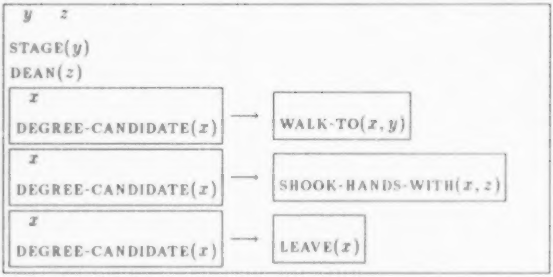
As said in section 3, (40) seems to support the hypothesis that telescoping becomes possible if the context makes it clear that what is being described is a routine performed by all the elements of the set quantified over. Until the routine is terminated, every sentence describing an event which is clearly part of the routine can contain a pronoun whose antecedent is the universally quantified NP. In cases like (39a), the routine may be already known to the reader: it is common knowledge that in graduation ceremonies a certain routine is required *of all the participants*.

Further support for this hypothesis comes from the fact that the more explicit the speaker is in signaling that a routine is being described, the easier telescoping becomes:

(41) Here is the procedure for the thesis defense. Every professor in the committee receives a copy of the thesis a month in advance. She writes down her comments and sends it back. ...

The simplest way to formalize this hypothesis, we believe, is to adopt the framework proposed in [Kamp, 1983; Kamp, 1990], in which the universal DRS is partitioned into a number of *articulated* DRS's. We will also assume, following [Kamp, 1983], that one of these articulated DRS's is used to represent those items which are in 'implicit focus'— i.e., those items which constitute 'background information' made salient by the discourse. For example, the discourse in (39a) causes a structure of the type in (42) to be added to the articulated DRS which contains the items in implicit focus, much in the same way that task structures are put in implicit focus in the dialogues observed by Grosz [1977]:

(42)

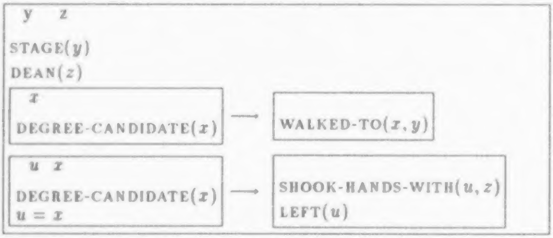

y z
STAGE(y)
DEAN(z)
x
DEGREE-CANDIDATE(x)
WALK-TO(x, y)
x
DEGREE-CANDIDATE(x)
SHOOK-HANDS-WITH(x, z)
x
DEGREE-CANDIDATE(x)
LEAVE(x)

Let's call a DRS like (42) a *script*. (The steps of the script should be ordered, of course, but we want to keep the representation as simple as possible.) Let's also say that a script is *active* when it has been copied into the articulated DRS which represents the implicit focus. A sentence *instantiates* a step of a script if the predicate of its matrix clause is identical with the predicate of the consequent of the step. The rule invoked to reconstruct the logical form of the second sentence of (6) may then be informally described as follows:

> *Step Reconstruction*: If the script K is currently active, and if the current sentence S instantiates a step K′ of the script following the last one which has been instantiated, then
>
> 1. add to the root DRS the tripartite DRS K″ whose restrictor is identical to the restrictor of K′, and
> 2. add (the S-structure of) S to the nuclear scope of K″

The interpretation for (6) that we derive from this (much simplified!) rule is shown in (6′). The tripartite DRS associated with the anaphoric sentence has universal force. Its restrictor has been reconstructed in the manner described above, and its nuclear scope consists of the clause "He shook hands with the dean and left." The truth-conditions of (6′) can be paraphrased as "Each student walked to the stage. Each student shook hands with the dean and left."

(6′)


y z
STAGE(y)
DEAN(z)
x
DEGREE-CANDIDATE(x)
WALKED-TO(x, y)
u x
DEGREE-CANDIDATE(x)
u = x
SHOOK-HANDS-WITH(u, z)
LEFT(u)

In order to develop this into a full-fledged account many more details should be added, of course. What is important, however, is that this account gives us the required universal force for the second sentence of (6).

E-type analysis

It has been proposed (by [Sells, 1985; Neale, 1990; Gawron *et al.*, 1991], among others) that the pronoun "he" in the second sentence of (39a) is an *e-type pronoun* [Evans, 1980; Parsons, 1978; Cooper, 1979]. We will follow here the presentation in [Neale, 1990]. The definition of e-type pronoun used by Neale is as follows:

(43) A pronoun P is E-type if is anaphoric on a quantifier Q that does not c-command P. [Neale, 1990]

The e-type hypothesis was motivated by examples like (44). Interpreting the pronoun "them" as bound by "Some sheep," as in (45), results in incorrect truth conditions. The problem with (45) is that it is true if Bill shaves just *some* of Harry's sheep. But intuitively, the truth of (44) requires Bill to shave *all* of Harry's sheep.

(44) Harry owns some sheep, and Bill shaves them. [Evans, 1980]

(45) [some x: sheep x](Harry owns x & Bill shaves x)

Because (46) is a more plausible paraphrase of (44), Evans proposed that the unbound pronoun "them" in (44) should be interpreted via the plural description 'the donkeys John bought', as in (47).

(46) Harry owns some sheep, and Bill shaves *the sheep Harry owns.*

(47) [some x: sheep x](Harry owns x) &
[the y: sheep y Harry owns y] (Bill shaves y)

The crucial property of e-type pronouns is *maximality*, defined by Neale as in (48):

(48) A quantifier '$[Dx : Fx]$' is *maximal* if and only if '$[Dx : Fx](Gx)$' entails '$[\forall x : Fx](Gx)$' for arbitrary G. ([Neale, 1990], p. 180)

The e-type approach appears to make the correct predictions for a number of cases of unbound anaphora, including cases in which the pronoun is singular, such as (49), or cases where the quantifier to which the pronoun is anaphoric is maximal, such as (50).

(49) *Just one man at my party* drank rum. *He* was ill afterward. [Neale, 1990]

(50) *The women who came at the party* were irritated by Bill; *they* complained, in particular, about his chauvinism. [Neale, 1990]

By claiming that the pronoun "he" in the second sentence of (6) is e-type, and assuming that the definite description operator 'the' is semantically equivalent to a universal quantifier with uniqueness restrictions, the e-type analysis assigns to (6) truth conditions that can be expressed in DRT by tripartite DRS (51) (in which we use a **the** operator with the same truth conditions as Neale's 'the'):

(6) Each degree candidate$_i$ walked to the stage. He$_i$ took his diploma from the dean and returned to his$_i$ seat.

(51)
$$\boxed{\begin{array}{l} x \quad y \quad z \\ \text{STAGE}(y) \\ \text{DEAN}(z) \\ \text{DEGREE-CANDIDATE}(x) \\ \boxed{\begin{array}{l} x \\ \text{DEGREE-CANDIDATE}(x) \\ \text{WALKED-TO}(x,y) \end{array}} \xrightarrow{\underline{\textbf{the}}} \boxed{\begin{array}{l} \text{SHOOK-HANDS-WITH}(x,z) \\ \text{LEAVE}(x) \end{array}} \end{array}}$$

First of all, let us note that (51) does obey the licensing condition we have proposed, and therefore would not represent, if correct, a counterexample to the main thesis of this paper. However, (51) is not a correct interpretation of (6). It suffers, in fact, ¿From the same problem that originally led Heim to give up the E-type account of donkey anaphora. In order for (51) to be true under the standard semantics for the definite description operator 'the' —that Neale assumes—it must be the case that only one student walked to the stage, which is not, of course, what (6) means.

Do we have, then, a conclusive argument against an e-type analysis for (6)? A possible way out, put forward by Neale in [Neale, 1990], is that the pronoun *is* e-type, but that the definite description operator 'the' is not the appropriate operator. Neale assumes that pronouns may be translated as *semantically numberless* definite descriptions, represented using the new logical operator 'whe', defined as follows:

(52) '[whe x: F x](G x)' is true iff $|\mathbf{F} - \mathbf{G}| = 0$ and $|\mathbf{F}| \geq 1$

Moreover, he assumes that two translations are available for pronouns, one using 'whe', the other using the singular or plural version of the definite description operator. If the 'whe' operator is used as the translation of "the" in (51), we obtain the right truth conditions for that sentence. On the other hand, we are now unable to explain why (1)-(4) are bad.

(1) ??Every dog$_i$ came in. It lay down under the table.

(2) *If every cat$_i$ purrs, it$_i$ is happy.

(3) *If John owes every man$_i$ money then Sam pays him$_i$.

(4) *John likes every dog$_i$ and Sam feeds it$_i$.

According to Neale, this is just as it should be; (1)-(4) should be ruled out pragmatically:

> ...some people have argued that an adequate semantical theory must prevent pronouns from being interpreted as anaphoric on 'every' phrases that do not c-command them. In my opinion, this is a mistake. ([Neale, 1990], p.232)

Neale is not very explicit about the kind of pragmatic factors that could be involved, but it seems reasonable to assume that one of these pragmatic factors might very well be our knowledge about scripts— our common knowledge that certain events involve the execution of the steps of a routine by each element of a given set. It's hard to see which other pragmatic factors might be involved in explaining the constrast between (6) and (1).

So, it doesn't seem to us that adopting Neale's position would lead to a significantly different account of that contrast. Nor is it clear to us that the system obtained by supplementing Neale's 'numberless descriptions' proposal with pragmatic factors would assign to (5)-(8) different truth conditions from the system we have used in this paper. It thus appears that such a system would still satisfy the Licensing Condition we propose.

7 Conclusions, Additional Data

We have proposed that telescoping in (5)-(8) is possible because in all of these cases the sentence in which the telescoped pronoun occurs can be assigned a tripartite structure. We have seen how the implicit parts of the tripartite structure can be reconstructed, and proposed semantic constraints on the reconstruction process.

Below are more cases of unbound anaphora to quantified antecedents which we did not discuss in this paper:

(53) a. Every boy wants a dog$_i$. *Every mother loves it$_i$. (Gawron)
b. Every boy wants a dog$_i$. Every mother will always love it$_i$.

(54) Either there's no bathroom$_i$ in this house, or it$_i$'s in a funny place. (Partee)

(55) Every man except John gave his paycheck$_i$ to his wife. John gave it$_i$ to his mistress.
(Cooper's variation on Karttunen's theme, in [Chierchia, 1990])

(56) Usually John hires a black limo$_i$. However, today/sometimes it$_i$ is blue. [Beaver, 1991]

(57) a. John has never ridden a camel$_i$. *And it$_i$ stank.
b. John has never ridden a camel$_i$. But Bill has. And it$_i$ stank.
[Grinder and Postal, 1971]

Acknowledgments

We wish to thank Cleo Condoravdi, Mark Gawron, Janet Hitzeman, Makoto Kanazawa, Tracy King, Peter Lasersohn, Chris Manning, Geoff Nunberg, Chris Piñón, and Len Schubert for suggestions and grammaticality judgments. Massimo Poesio was supported by the Air Force-Rome Air Development Center Research contract no.F30602-91-C-0010.

References

[Beaver, 1991] Beaver, D. 1991. DMG through the looking glass. In Quantification and Anaphora I - comments on papers by Groenendijk and Stokhof, Dekker and Chierchia, DYANA Deliverable R2.2.A.

[Belvadi, 1989] Belvadi, A. 1989. Quantified NPs and pronouns. Unpublished manuscript, University of Rochester.

[Carlson, 1987] Carlson, G. 1987. The semantic composition of English generic sentences. In Chierchia, G.; Partee, B.; and Turner, R., editors 1987, *Properties, Types, and Meaning.* D.Reidel Publishing Co., Dordrecht, The Netherlands.

[Chierchia, 1990] Chierchia, G. 1990. Anaphora and dynamic logic. In *Quantification and Anaphora I* - DYANA Deliverable R2.2.A.

[Cooper, 1979] Cooper, R. 1979. The interpretation of pronouns. In Heny, F. and Schnelle, H., editors 1979, *Syntax and Semantics 10.* Academic Press, Academic Press. 61–92.

[Dekker, 1990] Dekker, P. 1990. The scope of negation in discourse — towards a Flexible Dynamic Montague Grammar. in Quantification and Anaphora I - DYANA Deliverable R2.2.A - edited by J.Groenendijk, M. Stokhof, G. Chierchia and P. Dekker.

[Evans, 1980] Evans, G. 1980. Pronouns. *Linguistic Inquiry* 11(2):337–362.

[Fodor and Sag, 1982] Fodor, J. D. and Sag, I. A. 1982. Referential and quantificational indefinites. *Linguistics and Philosophy* 5:355–398.

[Gawron *et al.*, 1991] Gawron, J. M.; Nerbonne, J.; and Peters, S. 1991. The absorption principle and e-type anaphora. In *Proc. Third Conference on Situation Semantics and its Applications.*

[Grinder and Postal, 1971] Grinder, J. and Postal, P. 1971. Missing antecedents. *Linguistic Inquiry* 2(3).

[Groenendijk and Stokhof, 1990] Groenendijk, J.A.G. and Stokhof, M.J.B. 1990. Dynamic Montague Grammar. In Groenendijk, J.A.G.; Stokhof, M.J.B.; Chierchia, G.; and Dekker, P., editors 1990, *Quantification and Anaphora I.* DYANA Deliverable R2.2.A.

[Groenendijk and Stokhof, 1991] Groenendijk, J.A.G. and Stokhof, M.J.B. 1991. Dynamic Predicate Logic. *Linguistics and Philosophy* 14:39–100.

[Grosz *et al.*, 1983] Grosz, B.J.; Joshi, A.K.; and Weinstein, S. 1983. Providing a unified account of definite noun phrases in discourse. In *Proc. ACL-83*. 44–50.

[Grosz, 1977] Grosz, B. 1977. *The Representation and Use of Focus in Dialogue Understanding*. Ph.D. Dissertation, Stanford University.

[Heim, 1982] Heim, I. 1982. *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. Dissertation, University of Massachusetts at Amherst.

[Hornstein, 1984] Hornstein, N. 1984. *Logic as Grammar*. The MIT Press, Cambridge, MA.

[Kamp, 1981] Kamp, H. 1981. A Theory of Truth and Semantic Representation. In Groenendijk, J., Janssen, T. and Stokhof, M., editors 1981, *Formal Methods in the Study of Language*. Mathematical Centre, Amsterdam.

[Kamp, 1983] Kamp, H. 1983. SID without time or questions. Unpublished chapter of *Situations in Discourse*.

[Kamp, 1990] Kamp, H. 1990. Prolegomena to a structural account of belief and other attitudes. In Anderson, C. A. and Owens, J., editors 1990, *Propositional Attitudes—The Role of Content in Logic, Language, and Mind*. University of Chicago Press and CSLI, Stanford. chapter 2, 27–90.

[Krifka, 1992] Krifka, M. 1992. Focus and the interpretation of generic sentences. To appear.

[Neale, 1990] Neale, S. 1990. *Descriptions*. The MIT Press, Cambridge, MA.

[Parsons, 1978] Parsons, T. 1978. Pronouns as paraphrases. Unpublished ms., University of Massachusetts at Amherst.

[Roberts, 1987] Roberts, C. 1987. *Modal Subordination, Anaphora, and Distributivity*. Ph.D. Dissertation, University of Massachusetts at Amherst.

[Roberts, 1989] Roberts, C. 1989. Modal subordination and pronominal anaphora in discourse. *Linguistics and Philosophy* 12:683–721.

[Sells, 1985] Sells, P. 1985. Restrictive and non-restrictive modification. Technical Report CSLI-85-28, CSLI, Stanford, CA.

Massimo Poesio
University of Rochester
Department of Computer Science
Rochester, NY 14627-0226
`poesio@cs.rochester.edu`

Alessandro Zucchi
Stanford University
Department of Linguistics
Stanford, CA 94305
`zucchi@csli.stanford.edu`

Or and Anaphora[1]

Matthew D. Stone
Brown University

0. Introduction

Since Montague (1973), semantic theories have received precise implementations as algorithms that translate linguistic expressions compositionally into a logical language. Particularly troublesome for this strategy have been DONKEY sentences:

(1). If a man owns a donkey, he beats it.

The meanings of donkey sentences cannot be captured using a procedure which, like Montague's, uses the existential quantifiers of classical logic to translate indefinites and the variables to translate pronouns. The treatment of these examples requires meanings which depend on the context in which sentences appear, and thus necessitates a logic which models this context to some extent. If context is represented as the information conveyed in discourse, and the meanings of pronouns are enriched to depend on this information, the result is the E-Type approach (ETA) adapted by Heim (1990) from proposals in Evans (1980) and Cooper (1979). If the context is represented as a list of potential referents, and the meanings of indefinites are enriched to introduce new referents into this list, the result is a compositional formulation like Groenendijk and Stokhof's (1990) of the discourse representation theory (DRT) of Kamp (1981) and Heim (1982). Either tack suffices to capture the way in which the referents of *he* and *it* systematically correspond to the alternative possibilities described by the antecedent.

Disjunction offers a parallel way of introducing alternatives in the antecedent of a conditional, as shown in (2).

(2). * If Mary sees John or Bill, she waves to him.

It is natural to expect that because they exploit the same insight in accounting for (1) ETA and DRT would generalize equally well to an account for (2). This is not the case. The ETA encoding of context and pronoun meaning straightforwardly predicts the anaphora in disjunctive conditionals, once the obvious meaning for *or* is provided. In contrast, DRT can only explain (2) by adopting the operations on objects native to ETA. This distinction between the two approaches is a fundamental consequence of the difference in the mechanics and representations of the two systems, so the ability of ETA to generalize to disjunction constitutes a strong argument in its favor.

---

[1] This research was supported by NSF grant BNS 90-14676. Its formulation benefits from discussions with Harry Deutsch, Pauline Jacobson, and Barbara Partee. In addition, I have attempted to address in various places comments which Jeroen Groenendijk provided at the conference.

1. Heim's ETA

I initiate the argumentation that establishes this with a sketch of ETA and DRT that highlights the properties of the representation and use of context important later on. (A comprehensive exposition of the two systems is beyond the scope of this presentation, but the interested reader is referred to Heim 1990 or Chierchia 1992.) I turn first to ETA.

Heim's ETA encodes context as information using an important innovation in the model structure of logic: a set of indices called SITUATIONS. A situation is a representation of part of a world, or of a partial collection of facts about the world, which serves as a background against which to evaluate the truth of a formula. As with the indices of modal logics, the interpretation of predicates and relations can vary across situations, but because situations are partial, the values of predicates and relations may be undefined for some objects, rather than true or false. As information grows, propositions whose truth-value is undefined are resolved to true or false. So, like possible worlds, situations are linked by accessibility, but now accessibility encodes growth of information rather than alternative possibility. That is, the situation j is accessible from i when the information contained in j is an augmentation of the information contained in i. This structure among indices allows finer distinctions to be made than are made in classical logic. In fact, when Barwise and Perry (1981, 1983) first introduced situations to solve linguistic problems, it was to use this added structure to correctly distinguish propositions which receive identical interpretations in classical logic.

The precise logic of situations depends on several choices about indices and the relations between them, for which alternative positions give rise to distinct but consistent formulations. For example, different proposals have been made for the way in which the falsehood of a proposition in a situation is to be determined. Likewise, variations in ideas about indices distinguish several models of information growth. Heim has in mind the system in Kratzer (1988). Here situations do not contain negative facts; falsehood is established when the truth of a fact is ruled out in every extension of an information state. Meanwhile, each situation can extend only to a single total information state, that of its world.

These stands are vital in understanding the specifics of Heim's proposal, but the predictions of ETA carry over when alternative positions are taken. Despite their differences, each variant reflects a common intuitive understanding of situations which alone is vital to the success of Heim's ETA. It rests on two ideas. First, whether they are bunches of facts or pieces of worlds, situations are abstract structures finely discriminated (Kratzer 1988:612-614). In particular, situations can specify facts about an individual at a particular place and time without necessarily specifying other facts about that individual or about what else may be happening then and there. Second, despite their partiality, a situation specifies simple facts much as a world does, and no others. Complex propositions, such as those generated by disjunction, quantification, and modal operators, are not separately and explicitly encoded into a situation: as in classical logic, their truth in a situation is determined by the truth of simple facts there and the ways in which that situation is related to others. Hence, complex patterns are represented only implicitly (Landman 1986).

With this model structure, the meaning of a sentential formula remains a function from indices to truth values, as it is in modal logics. However, situations have been adopted in part because they allow the identification of them meaning of a proposition with a simpler set: the MINIMAL situations which verify it. Here is why. Information grows consistently, so once a formula is known to hold in a situation, it must hold in all situations accessible to it by the growth of information. This fact is known as the persistence of propositions. Consider the set of pieces of information i which have the property that p is true in i without being true given any proper subset of the information in i. It follows from persistence that every supersituation of an element in this set verifies p. Moreover, only such situations do, because whenever a situation verifies p, removal of information ultimately yields an element of this set. Thus, there is a one to one correspondence between propositions and these sets, their minimal situations. Simple facts will have only a single minimal situation in each world; but as explained in more detail below, facts derived from logical operations such as existential quantification will require many minimal situations. For a contradiction, the set of minimal situations which verify it is empty. I'll denote the minimal situations of a proposition p as $\mu(p)$.

With this architecture of situations, the information communicated in a discourse can be treated simply as the conjunction of the propositions which make it up. Such a context, κ, always identifies a unique set of minimal situations, $\mu(\kappa)$. This equivalence permits a natural realization of the relativized salient descriptions that Heim's ETA is to assign pronouns. The meaning of a pronoun is a function which maps each of the minimal situations of the context to an individual. Such a function is salient, an appropriate interpretation for the context in which it appears, just when its values are determined in a way that reflects the information structure of its domain. Every proposition containing such a function must now be evaluated with respect to a context which is to provide these minimal situations; its meaning must indicate not only whether it is true or false, but also how the context which results from incorporating it is to be constructed.

Let's examine exactly how Heim's proposal works, using this simplified variant of the perennial example:

(3). A man owns a donkey. He beats it.

Assume that this discourse appears in isolation. The context for the first sentence of (3) is therefore the set of situations that contain no contingent facts—one such situation for each world—and the minimal situations for the first sentence serve as the context for the second. As always, the first sentence, the erstwhile antecedent, receives the translation in (4).

(4). $\exists x \exists y\, [\text{MAN}'(x) \wedge \text{DONKEY}'(y) \wedge \text{OWN}'(x, y)]$

Now note that each of the minimal situations at which (4) is true contains some particular individual x_0 who is a man, and similarly some donkey y_0. For, in this situational logic, the verification of the complex propositions occasioned by existential quantifiers must proceed on the basis of the simple facts—such as *x_0 is a man* or *y_0 is a donkey*—of which situations are constituted. Moreover, x_0 is the ONLY man in that minimal situation, and y_0 the only donkey. Given the precise delineation of situations, the extra information about any superfluous individuals could be stripped away yielding a smaller situation which continued to verify (4). The existence of x_0, y_0, and their correlates renders well-defined and salient a function f_m which associates with each minimal situation of (4) the unique man there, and a function f_d that associates with each the donkey there.

The second sentence will pick up these functions respectively as the interpretation of *he* and *it*, as it contributes its information to the context. At each contextual situation, $t \in \mu(\kappa)$, the second sentence will determine a proposition

(5). $p(t) = \mathrm{BEAT}'(f_m(t), f_d(t))$

true at those extensions of t at which the man beats the donkey. Since the context going in to the second sentence consists of the union of the t's, the context going out should consist of the union of the $\mu(p(t))$'s. The set of situations which results is just the set of minimal situations where a man owns and beats some donkey, as is correct.

This logic shows how ETA can in fact assign the correct truth-conditions to (3), but it is equally important to verify that these rules do not countenance any incorrect interpretations. Many functions can be imagined which map the minimal situations of (4) onto individuals. Not all of them can serve as the interpretation of a pronoun in the consequent. For each function, ETA must explain precisely why it is or is not possible. To do this, Heim herself looks to a mechanism that licenses an E-type function by establishing a formal, syntactic link to between it and its antecedent. However, the following argument suggests that salience can be given a precise semantic characterization that constrains the functions with which pronouns are interpreted to those that actually can occur.

The necessary characterization depends only on two intuitively plausible manifestations of respect for context. The first is that a salient function must always pick out an individual in a situation that the situation gives information about. The functions f_m and f_d do meet this requirement, since each of the situations in their domain contain unique facts about individuals being men or donkeys, but many conceivable functions do not. One such example is the function f_Q, which gives some aribitrary but fixed individual, Dan Quayle perhaps, from each of the minimal situations of (4). f_Q does not respect the information in any situation in which Dan Quayle is neither man nor donkey. Since the situation gives no fact on the basis of which to determine who Dan Quayle is, it is not the information in it that goes into designating Dan Quayle there. (This argument only holds, of course, as long as (3) is not itself evaluated in a context from which Dan Quayle can be determined. This is to be expected: in such a case f_Q would in fact be a perfectly good interpretation of the pronoun in it.)

The second relevant dimension of respect for information ensures that a salient function take corresponding arguments to corresponding results. All of the minimal situations for (4) can be thought of as little copies of each other, since they all contain variants of the same three facts. By picking out an individual from each that is described by the same properties, f_m and f_d respect this relationship, but again, not all functions do this. f_h, for instance, picks out the donkey in half of the minimal situations and the man in the other half. Because each of the situations looks more or less the same, there is no criterion which distinguishes the situations in which f_h picks out a donkey on the basis of the information they contain. With f_h as with f_Q it is not the information in a situation that determines its value there.

The first principle, and the reasoning which applies it to f_Q, ensures that a function into individuals salient in the minimal situations of (4) picks out either the man or the donkey there. The second, and the reasoning which applies it to f_h, ensures that a salient function, if it picks out the donkey or the man in any particular situation, must do so in all of them. In short, the only salient functions in this example are the ones that actually serve as the interpretations of its pronouns.

The role that salience plays in restricting possibilities for anaphora informs the choice of working with MINIMAL situations. If pronouns applied to EVERY situation at which the first were true, even the two correct functions would no longer meet the above requirements: salience does not work if applied to constructs that contain too much information. For instance, in a situation which contains the same information about the two donkeys in it, no function that picks out a donkey is salient. Minimal situations don't have this problem: their partiality gives them the requisite tight, uniform structure. So minimal situations really are the crucial resource that makes ETA sensible.

For this treatment to extend to (1), all these observations must apply to conditionals. In particular, because pronoun meanings are constructed based on the minimal situations of the context, the definition of *if* must have the antecedent provide the context for the consequent. Heim's definition, (6), does this.

(6). $\varphi \rightarrow \psi$ (if φ, ψ) is true just in case every minimal situation in which φ is true extends to a situation in which ψ is true.

For, indeed, just the minimal situations at which the antecedent is true will be considered when evaluating the consequent. In all, the E-type theory assigns to (1) truth conditions that can be paraphrased with—(1) is true if and only if every minimal situation i at which some man owns some donkey extends to a situation in which the man at i beats the donkey at i.

This fixes the aspects of ETA crucial for the upcoming discussion. In ETA, the context is established as a set of minimal situations; pronouns are functions that look into the information contained in the context to choose, in a constrained way, an individual from each alternative that the context sets up. Two aspects of this system will prove distinctive: first, that minimal situations constitute a purely semantic representation of the meaning of some proposition, traditionally constructed; and second, that contextual complexity lies in the pronoun.

2. Dynamic DRT

In DRT, as in ETA, a context is constructed to represent alternative realizations of a discourse and is then used to determine reference. In DRT, however, the context directly encodes possibilities for anaphora instead of ETA's more general information. DRT describes each alternative in a context in terms of special variables called discourse markers which are used as the translations of pronouns. Whether a sentence that contains a pronoun is true or false depends on the object that is assigned to the corresponding discourse marker. Accordingly, sentences are always evaluated with respect to functions called discourse models that associate some entity of the world with each active discourse marker. The context for a series of sentences consists of all the discourse models in which it is true, and hence the effect of incorporating a sentence into the context is to restrict the context to those alternatives in which that sentence also is true. Conjunction, denoted $\underline{\wedge}$ in this language, generates the function that updates the context first with the argument on its left and then with the one on its right.

A new meaning for indefinites in dynamic DRT takes advantage of these contexts. As formulated by Groenendijk and Stokhof (1990, 1991) and Chierchia (1992), indefinites are translated using an unusual kind of existential quantifier, $\underline{\exists}$. Instead of quantifying over alternative variable assignments as usual, $\underline{\exists}$ quantifies over alternative discourse models to those in the context. $\underline{\exists}$ thereby expands and enriches the context so that all possibilities are considered for embedding the new variable which follows it. Because its role is to change the context, $\underline{\exists}$ does not really have a scope; it can bind the variable it introduces as long as that variable remains available.

Operations called tests, on the other hand, close off the availability of variables introduced within their scope. Included in this category are $\underline{\neg}$ and $\underline{\Rightarrow}$. Incorporating $\underline{\neg}\varphi$ into a context does not alter any elements of the context (as $\underline{\exists}$ does); it merely removes those discourse models which are compatible with φ. For example, $\underline{\exists}x$ MAN′(x) introduces the variable x to each contextual alternative, then accepts only the new alternatives in which x is assigned a man. $\underline{\neg}[\underline{\exists}x$ MAN′$(x)]$ thus lets pass only those alternatives for which no discourse models in which x is a man can be found. Subsequent reference to x is impossible. Meanwhile, $\varphi \underline{\Rightarrow} \psi$ tests that each way of extending a discourse model so that φ is true extends in turn to a discourse model in which ψ is true. Alternatives in which this is not the case are rejected by the test.

It is also possible to introduce λ-abstraction and intensional operators into this logic. This ensures that meanings can be provided for each word that specifies its contribution to sentence meaning. As expected, $\lambda\tau\varphi$ is a function that takes an object of the same type as τ and returns the interpretation of φ when that object is assigned to τ. If φ is a formula denoting a function to update the context, then $\hat{}\varphi$ denotes the function from contexts to contexts associated with the meaning of φ. These two operations interact in a slightly surprising way. If x is a discourse marker, the equivalence in (7) shows that an apparently free variable can be bound in an operation of λ-conversion.

(7). $\lambda p[\underline{\exists}x\ P(x) \vartriangle \check{}p](\hat{}Q(x)) \equiv \underline{\exists}x\ P(x) \vartriangle Q(x)$

Because the ˆ operator abstracts over discourse models, the interpretation of x is 'frozen' (to use Chierchia's term) exactly like the world used as the current one is 'frozen' in the expression of intensional logic below:

(8). $\lambda p[\Diamond(\check{}q \wedge \check{}p)](\hat{}\varphi) \equiv \Diamond(\check{}q \wedge \varphi)$

These definitions suffice to illustrate how dynamic DRT accounts for (1).

(1). If a man owns a donkey, he beats it.

The translations of *a man* and *owns a donkey* look very much like their translations in static Montague grammar. The translation of *a man* might be represented as in (9), if x_1 is a discourse marker that has not previously been introduced.

(9). $\lambda P[\underline{\exists}x_1\ \text{MAN}'(x_1) \vartriangle \check{}P(x_1)]$

Similarly, *owns a donkey* would be translated as (10) when rendered in terms of the discourse marker x_2.

(10). $\lambda x[\underline{\exists}x_2\ \text{DONKEY}'(x_2) \vartriangle \text{OWN}'(x, x_2)]$

However, because of the dynamic logic's added treatment of context, the similarity of these translations with Montague's is rather superficial. Thus, in (9), P is a DYNAMIC property, whose denotation is a function which, when provided its argument, returns not a truth-value but a function for updating the context. The meaning provided for *owns a donkey* is such a dynamic property. The first, when applied to the meaning of the second, results in (11).

(11). $\underline{\exists}x_1\ \text{MAN}'(x_1) \vartriangle \underline{\exists}x_2\ \text{DONKEY}'(x_2) \vartriangle \text{OWN}'(x_1, x_2)$

This represents a function for updating a context which could be expressed in words as follows: Take the context and extend each discourse model there to x_1 and x_2 in any way so long as the object assigned to x_1 is a man, and the object assigned to x_2 is a donkey.

The translation of the consequent is comparatively easy. Pragmatics determine that *he* is to be translated as x_1 and *it* is to be translated as x_2. This decided, *he* *beats it* is rendered just as $\mathrm{BEAT}'(x_1, x_2)$, a test that accepts contextual alternatives where the individual assigned to x_1 beats the one assigned to x_2. (11) and this are assembled using the dynamic definition of *if* described earlier, to yield the correct meaning. Symbolically, the result is (12).

(12). $[\exists x_1\ \mathrm{MAN}'(x_1) \triangle \exists x_2\ \mathrm{DONKEY}'(x_2) \triangle \mathrm{OWN}'(x_1, x_2)] \Rightarrow \mathrm{BEAT}'(x_1, x_2)$

The meaning of this is a function that builds a new context by considering in turn each of the alternative models of the old one. If every way of extending a given discourse model so that there is a man, x_1, that owns a donkey, x_2, results in a discourse model where x_1 beats x_2, the model is accepted. Otherwise it is rejected. Thus, this function narrows the context to the set of discourse models where, in fact, all men who own any donkeys beat them.

With this idea of how DRT accounts for examples like (1), we can more accurately assess its differences from Heim's ETA. By introducing new referents, indefinites play the principal role in ensuring that the correct possibilities for anaphora are constructed. Pronouns are translated simply as variables as they are in Montague's work. This contrasts with ETA, where indefinites receive the familiar, simple translation and complexity resides in the meanings assigned to pronouns. This might be described as a difference in DIRECTIONALITY: in DRT, sophisticated operations look FORWARD, setting up referents in advance; whereas in ETA they look BACKWARD, determining referents when needed. A related difference is that in representation. DRT relies on its relatively straightforward, relatively syntactic mechanism of an indexed list to keep track of possible referents, where ETA uses a relatively abstract, relatively semantic mechanism to keep track of information in general. The two issues of directionality and representation are the key ingredients in arguments about the treatment of disjunction in the two systems.

3. Disjunction

Sections 1 and 2 explored theoretical accounts the use of indefinite noun phrases in establishing connections between antecedents and consequents in conditionals. Here, I address the formulation of a more general theory of the way in which such correspondences are introduced. The data for this investigation is provided by conditionals in which the interpretation of the consequent parallels alternatives in the antecedent expressed using disjunction.

Sentences as simple as (2), repeated below, motivate the simultaneous consideration of correspondence anaphora and disjunction.

(2). If Mary sees John or Bill, she waves to him.

Here, as in (1), the pronoun *him* varies according to the individual chosen to realize the circumstances described in the antecedent. (2) asserts that when Mary sees John, she waves at John, and when Mary sees Bill, she waves at Bill. As always, the expectation is that such similar phenomena as the correspondences set up by indefinites and disjunctions should derive from a common underlying origin.

To extend earlier explanations to disjunctive cases, we will make the assumption that the meaning of a sentence like (2) derives from the relatively simple meaning of *if* that we've already seen, when combined with some straightforward meaning for *or*. In static treatments of the grammar, *or* is accounted for using the simple and elegant analysis seen, among other places, in Partee and Rooth (1982). The idea is to provide *or* with a polymorphic interpretation, denoted by the infix operator $\sqcup$, that can form the disjunction of two constituents of almost any type. When combining truth values, $\sqcup$ acts exactly like the connective $\vee$; for two functions of the same type, $\sqcup$ is defined as in (13).

(13). $f \sqcup g \equiv \lambda u\,[f(u) \sqcup g(u)]$

From the recursive step, it is clear that a function can be used in this definition only if it yields a truth value after taking all its arguments. Yet, expressions like names that usually denote individuals can combine using *or* as well. The simplest course in accounting for the disjunction there is to use Montague's translations of names like *John* and *Bill*: $\lambda P[P(j)]$ and $\lambda P[P(b)]$. These CAN be conjoined using $\sqcup$, to yield the appropriate $\lambda P[P(j) \vee P(b)]$. For Partee and Rooth, verbs and other constituents shift to slightly more complex translations when these more sophisticated arguments are supplied to them.

Amazingly, this polymorphic definition suffices to explain sentences like (2) in ETA. The meaning of *or* and the interpretations of *John* and *Bill* explained above determine the propositional formula obtained for its antecedent. It is simply:

(14). $\mathrm{SEE}'(m, j) \vee \mathrm{SEE}'(m, b)$

Now, the logic of situations treats disjunction much like the existential quantification that we saw earlier: a disjunctive formula can only be satisfied in a situation in virtue of the truth of one of its disjuncts there. Hence, given their disjunctive specification, the minimal situations at which (14) is true fall into two classes. Any situation in one set contains Mary seeing Bill, and no other individuals or events; any in the other contains instead Mary seeing John, and no other individuals or events. Recall that an appropriate function must use the information in each of these situations to pick out an individual: the same concerns that dictated that we must choose the man or the donkey out of the situations in (1) dictate that we must choose either Mary or the person she sees out of these situations. This second function must pick out Bill in the first set of situations described and must pick out John in the second sort. Sure enough, this precisely captures the reference of *him* in (2). The truth-conditions, correct, come out as:

(15). Every minimal situation in which Mary sees Bill or John extends to a situation in which Mary waves at the man she sees.

This simple solution is possible in ETA because of the directionality and representation of the system. ETA straightforwardly encodes the information associated with disjunction and lets the impact of disjunction on pronoun interpretation fall out from constraints placed elsewhere. Because the architecture allows pronouns to select their referents, there is no need to explicitly address the tricky question of the action of *or* in introducing new potential referents. The effect of *or* on anaphora cannot be finessed this way in DRT.

Standard dynamic DRT offers two possibilities for disjunction, neither of which accounts for the anaphora in (2). To see why they are inapplicable, bear in mind that the translation of *him*, like the DRT translation of every pronoun, must be some individual variable, say x_1. For this variable to refer either to Bill or to John, whichever is appropriate, it must be introduced in the antecedent of (2). Now, most frequently, *or* is modeled as a test, denoted as $\underline{\vee}$. This connective lets pass any discourse model in the context that could be truthfully continued with one of its arguments, but does not introduce any new models into the context. Because of this, no discourse markers introduced in either disjunct are available subsequently; nor are any new variables introduced to link referents between disjuncts. Since there is no way to obtain the needed x_1, $\underline{\vee}$ is of no help in accounting for (2).

The second interpretation of *or* in dynamic DRT is program disjunction, denoted $\cup$. The context that results from $\varphi \cup \psi$ consists of all of the discourse models which can be obtained by applying φ or ψ to the current context. Thus, if φ and ψ introduce the same discourse marker with two different constraints, the effect of program disjunction is to generate a new constraint on its interpretation equivalent to the disjunction of those in φ and ψ. Because it involves introducing the same marker in two places, program disjunction may lead to technical problems, but a more basic reason prevents its use here: standard formulations of dynamic DRT would not introduce any individual variables in interpreting either of the disjuncts in (2). If Bill and John have already been referred to in discourse, they will be interpreted using old markers, perhaps b and j. No opportunity for program disjunction to generate the needed x_1 will arise in this case, because program disjunction can only identify newly introduced markers.

To determine how best to resolve this difficulty, let us follow the argumentation of Rooth and Partee (1982).[2] Rooth and Partee note the need for the disjunction itself to introduce a new variable in the antecedent of (2). They argue that such an introduction is well-motivated, because the logic of such disjunctions of individuals renders it equivalent to existential quantification over an explicitly specified domain. If the mechanism by which language realizes existential quantification is through dynamic variable introduction, the same method should apply in these disjunctions. They suggest a rule for disjunction of individuals parallel to the rule for indefinites:

---

[2] Their paper presents ideas rather than explicit formulations, in part because DRT at that time did not incorporate the architecture necessary to implement them; the details in what follows therefore constitute in part my own interpretation.

just as *a donkey* introduces a variable, with the the constraint that its value be some donkey, *A or B* introduces a variable, with the constraint that its value be either that of *A* or that of *B*. In the notation of dynamic logic, A and B are dynamic montagovian property sets. We abstract over the variable each introduces using an equality property, and then indefinitely quantify over this abstraction. In symbols, the result of this disjunction rule with variable x_1 is as follows:

(16). $\lambda P[\exists x_1[A({}^{\wedge}\lambda x[x = x_1]) \veebar B({}^{\wedge}\lambda x[x = x_1])] \triangle {}^{\vee}P(x_1)]$

In (2), this disjunction applies to the dynamic properties of Bill and the dynamic properties of John to establish the properties of Bill or John, and a way to talk about Bill or John. This is exactly what we need to interpret (2). In all, we get the correct translation for it that is written out in (17).

(17). $[\exists x_1(j = x_1 \veebar b = x_1) \triangle \text{SEE}'(m, x_1)] \Rightarrow \text{WAVE}'(m, x_1)$

Rooth and Partee's treatment makes correct predictions for (2). However, more complicated examples exist which, although easy to explain in ETA, are accommodated within DRT only with much more complicated manipulation of variables than Rooth and Partee's. The added difficulty posed by these sentences reflects the fact that the disjunctions which they contain combine expressions of one category, but impact later anaphora for other types of constituents. Consider for instance (18):

(18). If Mary catches a fish or John traps a rabbit, Bill cooks it.

Here, too, the pronoun *it* is used to express two correspondences: when appropriate *it* refers to the fish, but when appropriate *it* refers to the rabbit.

For ETA, the explanation that we use for (18) is exactly the same as the explanation of (2). We translate the antecedent of (18) using existential quantifiers and the static meaning of disjunction, to yield this result:

(19). $\exists x\,[\text{CATCH}'(m, x) \wedge \text{FISH}'(x)] \vee \exists y\,[\text{TRAP}'(j, y) \wedge \text{RABBIT}'(y)]$

As before, this is satisfied in minimal situations of two different kinds: each i of the first type contains Mary and some unique fish $f_f(i)$, while each i of the second contains John and some unique rabbit $f_r(i)$. If we are to choose a function that picks an individual other than Mary or John from each of these situations, it must select $f_f(i)$ or $f_r(i)$, whichever is appropriate at i. But this is exactly what the pronoun in the consequent does refer to: the rabbit or the fish, whichever it turns out to be.

Rooth and Partee's rules, on the other hand, will not account for the anaphora if applied to (18). As always, if *it* is to receive a correct interpretation as x_1 in the consequent of (18), the variable x_1 must be introduced in the antecedent in such a way as to potentially pick out either a rabbit or a fish. The rules considered earlier would work if the two NP's *a rabbit* and *a fish* were combined. However, the sentence does not contain the explicit disjunction the two noun phrases for which we must introduce a variable: it joins full sentences instead.

For sentence (18) to be correctly interpreted, then, some principle must apply which relates the discourse entities introduced INSIDE one disjunct to those introduced in the other. This is exactly what program disjunction does, and in fact, program disjunction will give the correct result in this case. Suppose the indefinites in the two disjuncts translate in terms of the same variable x_1, and the union of the contexts generated by the disjuncts is the context for the consequent. The rule for *if* then tests every assignment in which x_1 is a fish that Mary catches and every assignment in which x_1 is a rabbit that John traps, to make sure that Bill cooks x_1. x_1 is the fish or the rabbit, whichever appropriate, and the correspondence is established.

Unfortunately for program disjunction, examples analogous to (2) show that linking between disjuncts must take place when objects are referred to, as well as introduced:

(20). If Mary hasn't seen John lately, or Ann misses Bill, she calls him.

(20) violates the prediction of program disjunction that as many new variables are available after a disjunction as are introduced in each disjunct. The disjuncts introduce no variables, yet two new variables are available subsequently.

A more dramatic example of the failure of this prediction is found in the discourse below.

(21). It's interesting what happens if a man calls a woman or a woman calls a man. Sure, they're nervous about making the call, and they're surprised to get it. But even today, she waits for him to ask her out.

With only a small amount of awkwardness, (21) manages to use pronouns corresponding to all four combinations of the individuals set up in the scenario, even though each disjunct sets up only two discourse referents. Again, for (21) to be interpreted in DRT, discourse variables must be introduced at the disjunction itself. Indeed, (21) shows that it it is not enough for the interpretation rule for *or* to introduce a discourse variable not corresponding to SOME pairing of variables introduced or referred to in each disjunct. Needed are new variables corresponding to EVERY such pairing. The involved procedure of establishing all these linkings represents a combination of the mechanisms of program disjunction and variable introduction we've seen earlier, plus an extension of both.

Meanwhile, ETA as it has been already outlined captures the meanings of all four pronouns in (21). Recall that the two constraints used earlier to describe salience were that a salient function always picks out an individual described in a situation and always designates corresponding individuals in corresponding situations. Their application to the context set up in (21) determines first that a salient function must return the woman or the man in each situation, and second that its value on the two kinds of situation in the context—those where the man calls the woman, and those where the woman calls the man—must be uniform. However, no constraint is placed on how the individual chosen in one kind of situation is related to the individual chosen in the other. This is correct. Choosing the man in the first set and the woman in the second gives the interpretation of the first *they*; choosing the woman in the first and the man in the second gives that of the second *they*; always choosing the woman gives the interpretation of *she* and *her*; always choosing the man gives the interpretation of *him*. Each of these functions is salient according to the simple definition above.

Thus we find that ETA generalizes easily from existential quantification to disjunction. DRT, however, requires the implementation of an involved rule for disjunction that encodes through the introduction and pairing of variables the effect of *or* on later anaphora. It is worthwhile to examine the reasons why the rule for DRT seems so much more involved: I claim it is because DRT, to accommodate *or* must incorporate the machinery of ETA without importing the representation and directionality that makes that machinery sensible.

Recall that the initial versions of DRT and ETA outlined earlier made essentially identical predictions. This was because their operation was for the most part isomorphic. The difference is minimal between a set of discourse models and a set of situations paired with a set of functions from situations to individuals. To verify this, think of a variable, when dynamically bound by an existential quantifier of dynamic DRT, as a function that picks out the appropriate individual in the appropriate contextual alternative. Now, what we have discovered here is that the second notion, that of a function, generalizes easily when we must consider the effect of taking the union of two sets of situations. In contrast, to maintain variables, we were required to pair up variables and introduce new ones in their place. We motivated the pairing operation by examining data, but it can be motivated theoretically in terms of the conception of variable as function mentioned above. The functions available in the union of two contexts A and B ought, intuitively, to consist of any and all of those functions whose restrictions to A and B are functions available in those domains. This is how and why ETA makes the predictions it does. When variables approximate those functions, as in DRT, the equivalent move is pair up variables in each component context in all possible ways, to derive the new variables that may be used subsequently. This perspective reveals how DRT, extended to incorporate a rule to this effect, must be regarded as a recreation of the E-type theory without the semantic representation that informs it.

The DRT perspective is not only derivative. Measured by the standard of computational complexity, the strategy of DRT must also be regarded as the more costly one. Here complexity analysis is only a convenient and objective mathematical measurement to use in applying Occam's razor. Examples like (21) suggest that to find the appropriate interpretation for a pronoun after a disjunctive antecedent, one must select one out of a set of possibilities whose cardinality grows exponentially as the number of disjuncts increases. In the ETA, salient functions can remain implicit until the occurrence of an anaphor requires one, so one can imagine consistently making a good guess about the appropriate function to use in such a way that the exponential number of possibilities was never a problem. Not so in DRT as described above: Each possibility must be explicitly represented in advance as a variable in a discourse model whose size no smart choices in interpretation can reduce. This is why ETA's directionality seems better suited to the problem.

4. Extensions and Prospects

So far, we have considered the effect of disjunction on possibilities for pronomial anaphora. But, as illustrated in this example, from Rooth and Partee (1982), the alternatives introduced by *or* can affect anaphora of other constituents as well.

(22). If Mary swims or dances, then Sue does.

On one reading, the sentence uses VP-ellipsis to calin that Sue swims or dances when Mary swims or dances, but on the other, the sentence asserts that when Mary swims and when Mary dances Sue performs the same activity Mary does. This latter reading suggests that context plays the same role in licensing VP-ellipsis as it plays in establishing the possibilities for pronomial anaphora. Investigating this hypothesis reinforces the arguments presented above in favor of ETA.

In both theories, the method of constructing this parallel is clear. In ETA, recall that the key step is the assumption that pronouns are interpreted as salient functions from situations to individuals. Analogous here is the postulate that *does* has a null-complement which is interpreted as a salient function from situations to properties. It is more difficult to specify criteria governing the salience of properties in situations that those developed for the salience of individuals. However, some straightforward principles about the identification of a property P offer a good characterization. First, any property P makes the same claim about all individuals; this reflects, for example, the fact that *John saw Mary* ascribes to John what *Ann saw Mary* ascribes to Ann. The logical behavior of P can therefore be reconstructed from the behavior of the fact $P(a)$ for any individual a. Second, the fact $P(a)$ may be realized in many ways. For instance, the property of seeing someone is shown true of John with the fact that John saw Mary, that John saw Bill, etc. This suggests that a property is fully described in a context when (but only when) a complete catalog of the ways in which it can be shown true of an individual is provided by the context. Only such fully described properties should be salient; what's more, the property chosen at a situation i should reflect what is happening at that particular index. In the examples presented here, this can be collapsed to the constraint that the property chosen at i must in fact be true of some individual at i.

These constraints identify the correct two properties for (22). The antecedent is translated as in (23).

(23). $\text{SWIM}'(m) \vee \text{DANCE}'(m)$

Again we have two kinds of minimal situation, and again we must pick out a salient object from each. This time we will be choosing a property from each as outlined above. Since the minimal situations for the property of swimming and the property of dancing are describable from the minimal situations of (23), any combination of those properties can be reconstructed. However, the property selected must hold of Mary in virtue of her swimming in the first kind of situation and her dancing in the second: for the property must be true of someone. This leaves salient the two functions which are actually appropriate: the function that picks out the property *swims or dances* at each index, and the function that picks out at each index the property *swims* or the property *dances*, whichever takes place there. When the complete interpretation is constructed using this second function, the meaning of the correspondence reading results:

(24). Every minimal situation in which Mary swims or dances can be extended to a larger situation either in which Sue swims or in which she dances, whichever Mary does in the minimal situation.

Extending DRT to an account of these correspondence phenomena requires a significantly more involved extension, the beginnings of which are also to be found in Rooth and Partee's 1982 paper. They propose the following analogy between the mechanics of VP ellipsis and those of pronomial anaphora. Each time a verb phrase appears, it introduces a new property variable into the discourse model corresponding to it, just as each indefinite contributes a new individual variable. *Does* receives one of these property variables as its null complement. Rooth and Partee round out the parallel with a variant of the principle they used for individual disjunction to account for property disjunction: disjunction of verb phrases is just interpreted as existential quantification over a two-element set of properties.

For example, we now translate *swims* and *dances* so that appropriate variables are introduced. This gives (25a) and (25b) respectively.

(25). a. $\lambda x[\exists P_1\ P_1 = {}^\wedge\text{SWIM}' \,\Delta\, {}^\vee P_1(x)]$
b. $\lambda z[\exists P_2\ P_2 = {}^\wedge\text{DANCE}' \,\Delta\, {}^\vee P_2(x)]$.

The general rule to build a new property out of two such dynamic property meanings looks a lot like (16). The rule starts with the property A, in which variable P_1 is introduced, and the property B, in which P_2 is, and gives (26).

(26). $\lambda z[\exists P_3 (A(z) \,\Delta\, P_1 = P_3) \veebar (B(z) \,\Delta\, P_2 = P_3)]$

When this expression is incorporated into the meaning of a sentence, some new variable P_4 is introduced which corresponds to this property in its entirety.

Application of this procedure leaves the variables P_3 and P_4 available. This gives the correct predictions for (22). In the translation of the antecedent, we recreate the schema in (26) with A as in (25a) and B as in (25b). Hence, P_3 contains the property *swims* or the property *dances*, whichever takes place; P_4 contains the property *swims or dances*. Since these two variables are available in the interpretation of the consequent, this analysis reproduces the ambiguity explained earlier using ETA.

Rooth and Partee's proposal has the conceptual fault that the context maintained to determine the possibilities for VP ellipsis is unrelated to the context maintained for pronomial anaphora. This account does hypothesize parallel operations for its two kinds of variables, but the two contexts remain distinct. In contrast, ETA, whose parallel operations for different kinds of anaphora are performed on the SAME representation, is clearly more theoretically parsimonious.

Compounding the theoretical deficiency of DRT is an empirical difficulty with the proposal as it stands. Like Rooth and Partee's rule for NP disjunction, this procedure expects the disjuncts it combines to have the same type as the potential anaphors they introduce. However, disjunction has the same effect on verb phrase anaphora no matter what constituents are involved. (27) is a simple example that illustrates the ease with which this fact falls out under ETA and the problems it causes for DRT.

(27). If Mary waves at John or Bill, so does Sue.

This sentence offers two readings analogous to those present in (22). In the first, Sue waves at John or Bill when Mary waves at one of them; in the second, Sue waves at the same person that Mary does.

ETA does not distinguish between (22) and (27), because of its completely semantic representation. Substitute waving at John for swimming, waving at Bill for dancing, and the argument described for (22) applies at once to (27).

No DRT rule so far considered explains the correspondence reading in this sentence. Its antecedent appears to introduce a VP only once, when *waves at John or Bill* is incorporated into the derivation, yet two property variables appear to be available in the context that follows. Additional property variables offer one method for resolving this difficulty. For example, *John or Bill*, interpreted as in (28), would leave the variable P_1 needed to explain the correspondence ellipsis, as well as the variable x_1 needed for the interpretation of pronouns, available for reference after the antecedent.

(28). $\lambda P[\exists x_1\, \exists P_1\, (x_1 = j \vee x_1 = b) \wedge P_1 = P \wedge {}^{\vee}P_1(x_1)]$

No principles inform the effect of predicates on context in DRT which might militate against this strategy: data was always the principal motivation for the introduction of property variables. As such, this constitutes another example of a technical solution in DRT best understood in light of the representations and predictions of ETA.

A second approach in DRT to the ambiguity of (27) appeals to the notion of scope. A property variable with value $\text{WAVE}'(x_1)$ can be introduced by quantifying in *John or Bill* for some variable x_1 in the antecedent after the VP contributes its variable to the context. Thus, the correspondence reading is obtained when wide scope is assigned to the disjunction.

The correlation with scope that this predicts is in fact observed. For example, in (29), the use of *he* in the consequent forces the interpretation of the antecedent in which *or* has wide scope over *all*.

(29). If every donkey chases John or Bill, he runs away.

However, though a full treatment of the impact of scope on this problem cannot be presented here, the analysis below suggests that it may be more perspicuous to treat this consequence of scope semantically in ETA than syntactically in DRT. DRT's explanation is couched in terms of the formal operations chosen to model the effect of words on later referents. For dynamic DRT, *every donkey* creates a test which closes off the variables introduced in its scope. If it is given wide scope in (29), it eliminates the individual variable introduced at the disjunction needed to interpret the later pronoun. In contrast, ETA appeals to the meaning of *every* in its account to show directly that when *every* is given wide scope, the meaning needed to interpret the pronoun in the consequent is impossible to obtain. When *every donkey* has wide scope, the information required to verify the truth of the antecedent consists of an identification of all of the donkeys and a demonstration for each donkey either that it chases John or that it chases Bill. Any such piece of information yields a minimal situation for the antecedent on this reading, but these pieces of information do not specify any distinctive information about Bill or John. One way to see this is through the arguments presented earlier that rule out salient functions on representations which contain too much information, which apply again here. Some minimal situation in some possible world contains, say, eight equivalent donkeys of which four chase John and four chase Bill, giving the exact same information about the two men. A function that respects the information in this situation must pick out both or neither. Hence the ungrammaticality.

Thus, verb phrase ellipsis offers a case parallel to pronomial anaphora in which a backward-looking semantic architecture like that of the E-Type analysis provides a more natural framework to describe the effect on context initiated by disjunction. The reconciliation between multiple kinds of anaphora ETA suggests makes it particularly attractive.

I close with a word about where the argumentation presented here in favor of ETA might fit in. This paper instantiates a general argument used by many researchers in advocating purely semantic or combinatorial accounts of phenomena usually explained using variables. Outside DRT, variables and rules to coindex them typically account for problems of binding, control and agreement. For each of these functions there is an alternative. Szabolcsi (1987) shows how binding of reflexives might be achieved using syntactic and semantic operations on the functions that the ontology of standard model-theories already provide. Dowty (1985) considers the replacement of theories of control based on variable binding by alternatives which exploit the resources of axiomatized constraints on acceptable semantic models. Jacobson (1991) examines the use of bound pronouns in general, and argues that their behavior can be modeled without indexing provided that the meanings are assigned to pronouns and the way those meanings are combined proceeds appropriately. Dowty and Jacobson (1989) and Pollard and Sag (1988) both emphasize the semantic rather than syntactic contribution to agreement.

As a rule, these proposals are claimed to be superior because of their more successful generalization: to treat unusual cases they cover naturally (cases that typically include conjunction and disjunction), syntactic accounts are forced to import or recreate the apparatus of the semantic account—the very occurrence we have just found here. The arguments above to prefer the E-type analysis over DRT constitute a particularly complementary addition to this literature because of the unusual status of the variables of DRT. Unlike other variables, it is argued that the discourse markers of DRT are fundamental to semantics: so much so that the meanings of sentences are to be modeled principally as functions describing the assignment of values to these variables. Finding, specifying, and arguing for an alternative to these strange entities is therefore a key step in constructing a grammar of language free from essential variables and variable binding operations.

References

Barwise, Jon, and John Perry. 1981. Situations and attitudes. *Journal of Philosophy* 7.11.

Barwise, Jon, and John Perry. 1983. *Situations and attitudes*. Cambridge, Mass: Bradford Books.

Chierchia, Gennaro. 1992. Anaphora and dynamic binding. *Linguistics and Philosophy* 15.111-183.

Cooper, Robin. 1979. The interpretation of pronouns. *Syntax and Semantics 10*, ed. by Frank Heny and Helmut Schnelle. New York: Academic Press.

Dowty, David. 1985. On recent analyses of the semantics of control. *Linguistics and Philosophy* 8.291-331.

Dowty, David and Pauline Jacobson. 1989. Agreement as a semantic phenomenon. *ESCOL 88 Proceedings*, 95-108. Columbus: Ohio State University.

Evans, Gareth. 1980. Pronouns. *Linguistic Inquiry* 11.337-362.

Groenendijk, Jeroen and Martin Stokhof. 1990. Dynamic Montague Grammar. *Papers from the Second Symposium on Logic and Language*, ed. by L. Kalman and L. Polos. Budapest: Akademiai Kiado.

Groenendijk, Jeroen and Martin Stokhof. 1991. Dynamic Predicate Logic. *Linguistics and Philosophy* 14.39-100.

Heim, Irene. 1982. *The semantics of definite and indefinite noun phrases*. Ph.D.

dissertation, University of Massachusetts, Amherst. Published 1987, New York: Garland Press.

Heim, Irene. 1990. E-Type pronouns and donkey anaphora. *Linguistics and Philosophy* 13.137-177.

Jacobson, Pauline. 1991. Paycheck pronouns, functional gaps, and variable binding. Paper given at 1991 ASL/LSA Conference on Logic and Linguistics.

Kamp, Hans. 1981. A theory of truth and semantic representation. *Truth, interpretation and information* ed. by Jeroen Groenendijk et al. Dordrecht: Foris.

Kratzer, Angelika. 1989. An investigation of the lumps of thought. *Linguistics and Philosophy* 12.607-653.

Landman, Fred. 1986. Data semantics: an epistemic theory of partial objects. *Towards a theory of information: The status of partial objects in semantics* by Fred Landman, 1-96. (GRASS 6) Dordrecht: Foris.

Montague, Richard. 1973. The proper treatment of quantification in ordinary English. *Approaches to Natural Language* ed. by Jaakko Hintikka, et al. Dordrecht: Reidel. Reprinted in *Formal philosophy: selected papers of Richard Montague* ed. by Richmond Thomason. New Haven: Yale University Press.

Partee, Barbara and Mats Rooth. 1982. Generalized conjunction and type ambiguity. *Meaning, Use, and Interpretation* ed. by Rainer Bäuerle et al, 361-383. New York: de Gruyter.

Pollard, Carl and Ivan Sag. 1988. An information-based theory of agreement. *CLS Parasession on Agreement*. Chicago Linguistic Society, Chicago.

Rooth, Mats and Barbara Partee. 1982. Conjunction, type ambiguity, and wide scope 'or'. *Proceedings of the First West Coast Conference on Formal Linguistics* ed. by D. Flickinger et. al. Stanford: Linguistics Department, Stanford University.

Szabolcsi, Anna. 1989. Bound variables in syntax: are there any?. *Semantics and contextual expression* ed. by Renate Bartsch et al. 295-318. Dordrecht: Foris.

Department of Cognitive and Linguistic Sciences
1978 Brown University
Providence RI 02912
mas@cs.brown.edu

Intervention effects, monotonicity and scope

Henriëtte de Swart
University of Groningen

0. Introduction

Recent studies have demonstrated that the phenomenon of 'quantification at a distance' in French plays an important role in modern linguistic theory. An interesting problem which Obenauer (1976, 1984) brings up concerns intervention effects. The present paper argues that Rizzi's (1990) syntactic and Zwarts and Szabolcsi's (1991) semantic approach to extraction only provide a partial explanation of this phenomenon. It is shown that scope rather than monotonicity provides the clue to extraction out of weak islands. The prohibition against narrow scope and the correlation established between monotonicity and scope explain the intervention effects in the French quantification at a distance and the Dutch *wat voor*-split.

1. A syntactic approach to quantification at a distance

1.1 Some facts

The particular characteristic of expressions like *beaucoup* ('many', 'a lot') in French is that they can function as ordinary determiners (1a), or can be separated from the rest of the NP by the past participle (1b):

(1) (a) Jean a conduit beaucoup de camions
Jean has driven many of trucks
(b) Jean a beaucoup conduit - de camions
Jean has many driven of trucks
(c) Jean a beaucoup conduit
Jean has a lot driven

The position which *beaucoup* occupies in (1b) is the same as in (1c), where there is no object NP. The usual analysis of (1c) is that *beaucoup* functions as an ordinary VP-adverb. The position of *beaucoup* in (1b) can then be characterized as an adverbial position. Similar examples can be given for *peu* ('few'), *trop* ('too much'), *assez* ('enough'), *autant* ('so many'), *tellement* ('so many'), *pas mal* ('not few'), etc:

(2) (a) Max a peu vendu - de livres
Max has few sold of books
(b) Marie a trop mangé - de carottes cette année
Marie has too many eaten of carrots this year

Although *beaucoup*, *peu*, *trop*, etc. are in an adverbial position, many syntactic analyses claim that they continue to function as a sort of determiner. This means that there is an empty position in the part of the NP which is left behind, which is bound by the quantifier (cf. Kayne, 1984):

(3) Max a $[_{QP}$ beaucoup] vendu $[_{NP}$ $[_{QP}$ e] de livres]

Obenauer points out that the event should be countable, so that the adverb can express a notion of iterativity. This is illustrated by (4):

(4) (a) Le maire a salué beaucoup de sportifs
The mayor has greeted many of sportsmen
(b) Le maire a beaucoup salué de sportifs
The mayor has many greeted of sportsmen

(4a) can correspond with one greeting event in which many sportsmen are involved or with many greeting events for individual (or small groups of) sportsmen. (4b) lacks the single event reading: the sentence can only mean that there were many sportsmen who were individually or in small groups greeted by the mayor. The meaning of *beaucoup* is then close to that of a frequency adverb like *souvent* ('often').

Separation of the quantifier and the rest of the NP is also possible for expressions introduced by *combien* ('how many'):

(5) (a) Tu as rencontré combien de ministres chez Jean?
You have met how many of ministers at Jean
(b) Combien de ministres as-tu rencontré chez Jean?
How many of ministers have you met at Jean's
(c) Combien as-tu rencontré - de ministres chez Jean?
How many have you met of ministers at Jean's

Interrogative constructions in French can leave the object NP in position (5a). They can also move the NP as a whole in front (5b). The third possibility is to move only the interrogative *combien* and leave the rest of the NP in the regular object position (5c). Obenauer suggests that, in general, this way of splitting correlates with the presence of a preposition. In both constructions of quantification at a distance exemplified until now, we find the partitive preposition *de* ('of'). A third construction involving *de* is based on nominal groups like *qui d'intéressant* ('who of interest'), *rien d'autre* ('nothing else'), which can also split:

(6) (a) Rien d'extraordinaire n'a été prévu
Nothing extraordinary NEG has been foreseen
(b) Rien n'a été prévu d'extraordinaire
Nothing NEG has been foreseen of extraordinary

(7) (a) Qui d'intéressant dit-il qu'il a rencontré?
Who of interesting says he that he has met

(b) Qui dit-il qu'il a rencontré d'intéressant?
Who says he that he has met of interesting

Examples from other languages where splitting correlates with prepositions are the *was für*-split in German and the *wat voor* split in Dutch:

(8) (a) Was für ein Werkzeug sucht er? [German]
What for a tool is he looking for
(b) Was sucht er für ein Werkzeug?
What is he looking for a tool

(9) (a) Wat voor boeken heb jij gelezen? [Dutch]
What for books have you read
(b) Wat heb jij voor boeken gelezen?
What have you for books read

Quantification at a distance is thus a cross-linguistic phenomenon.

1.2 **Intervention effects**

An interesting problem which Obenauer (1976: 64 ssq.) brings up concerns the ungrammaticality of (11b) versus the grammaticality of (10):

(10) (a) Le douanier a pas mal fouillé combien de valises?
The customs-officer has not badly searched how many of suitcases
(b) Combien de valises le douanier a-t-il pas mal fouillé?
How many of suitcases the customs-officer has he not badly searched

(11) (a) Combien le douanier a-t-il fouillé de valises?
How many the customs-officer has he searched of suitcases
(b) *Combien le douanier a-t-il pas mal fouillé de valises?
How many the customs-officer has he not badly searched of suitcases
(c) Combien le douanier a-t-il soigneusement fouillé de valises?
How many the customs-officer has he carefully searched of suitcases

The sentences under (10) show that expressions like *pas mal*, *beaucoup* can function as independent VP-adverbs in interrogative sentences. (11a) shows that splitting is allowed. The ungrammatical (11b) shows that *beaucoup* cannot intervene between the interrogative and the part of the NP which is left behind. This is surprising, for one could theoretically establish a correct binding relation between *combien* and *de* N, as in (10a) and (10b). A first guess would be that no adverb can intervene between *combien* and the rest of the NP, but this is not true, as (11c) shows. We observe the same type of restriction on other constructions involving quantification at a distance:

(12) (a) Qui d'autre cette femme a-t-elle beaucoup aimé?
Who of else this woman has she a lot loved
(b) Qui cette femme a-t-elle aimé d'autre?
Qui this woman has she loved of else
(c) *Qui cette femme a-t-elle beaucoup aimé d'autre?
Who this woman has she a lot loved of else
(d) Qui cette femme a-t-elle profondément aimé d'autre?
Who this woman has she deeply loved of else

Obenauer (1984) claims that the restrictions on quantification at a distance are a typical instance of local binding. He assumes that the trace of a quantifier must be locally bound by the closest possible binder. Ungrammaticalities arise if, as a consequence of this local binding, the *combien/ qui* has nothing left to bind. This hypothesis accounts for unacceptable sentences like (13):

(13) *Combien as-tu beaucoup consulté de livres?
$[_{OP}$ combien] .. $[_{OP}$ beaucoup] .. $[_{NP}$ $[_{OP}$ e] de livres]

The empty quantifier phrase in the object is locally bound by *beaucoup*, although it is strictly spoken the trace of *combien*. As a consequence, *combien* has no variable left to bind and the sentence is ruled out by the prohibition against vacuous quantification.

Obenauer's treatment can is successful in cases like (13), but there are also some problems. For instance, his theory is less felicitous for examples like (12c), for here there is no binding relation possible with the closest quantifier. Consider (14a) and (14b) which are both ungrammatical:

(14) (a) *Cette femme a aimé beaucoup d'autre
This woman has loved a lot of else
(b) *Cette femme a beaucoup aimé d'autre
This woman has a lot loved of else

The reason is that *qui* in (14) is a pronominal which has the status of an NP, whereas *beaucoup* has the characteristics of a determiner or an adverb.

In the same way, the behaviour of frequency adverbs is problematic. Recall that Obenauer (1984) observes that *beaucoup* in constructions of quantification at a distance expresses event quantification. Its meaning is therefore close to the semantics of a frequency adverb like *often*. In a footnote, Obenauer points out that this class of adverbs also yields rather unacceptable results in quantification at a distance constructions:

(15) (a) *?Combien as-tu souvent consulté de livres?
How many have you often consulted of books

(b) ??Combien as-tu rarement conduit de voitures?
How many have you seldom driven of cars

Obenauer calls this a process of pseudo-binding, 'parasitic' on the one in (13), but he provides no analysis of this phenomenon. Obviously, frequency adverbs do not bind the empty determiner position in the direct object, as the ungrammaticality of (16) shows:

(16) (a) *J'ai souvent consulté de livres
I have often consulted of books
(b) *J'ai rarement conduit de voitures
I have seldom driven of cars

If the intervening quantifier cannot bind the empty position, it is unclear how it can count as the closest potential binder. Intuitively, the facts in (11b), (12c) and (15) are closely related, but Obenauer's hypothese of local binding can explain only one of the three cases. The idea of local binding then clearly needs to be modified.

A revised analysis of the quantification at a distance construction is provided by Rizzi (1990). He claims that this phenomenon can be explained in terms of the principle of Relativized Minimality. The basic idea is that intervention is dependent on the character of the binding relation. An intervening A-operator blocks binding in an A-chain, and an A'-operator blocks binding in an A'-chain. The construction of quantification at a distance in French clearly involves an A'-phenomenon in Rizzi's system, for the antecedent of a wh-trace is in an A'-specifier position. So any A'-operator between *combien* and the part of the NP which is left behind blocks the intended binding relation. Relativized Minimality accounts for all the ungrammaticalities under (11b), (12c) and (15). An argument in favour of this approach is the fact that A-operators like floating quantifiers do appear in between *combien* and the part of the NP which is left behind:

(17) (a) Combien de livres ont-ils tous lu?
How many of books have they all read
(b) Combien ont-ils tous lu de livres?
How many have they all read of books

Adopting the analysis of floating quantifiers developed by Sportiche (1988), *tous* is in an inner subject position, which counts as a regular argument position. As an A-binder, *tous* in (17b) does not count as a potential governor for *de livres* in Rizzi's view. Accordingly, *tous* is transparent and does not block extraction.[1] Rizzi's principle of Relativized Minimality then accounts in an interesting way for the minimal contrast between A'-

---

[1] Thanks to Frank Drijkoningen for pointing this out to me.

operators (11b) and A-operators (17b) in an A'-chain.

Rizzi's analysis seems to work quite well for quantification at a distance and a number of other cases. But his approach does not answer the question why certain intervening expressions create island effects and block extraction, whereas others do not. Rizzi points out that a number of problems which arise with respect to the role of negation and referentiality in extraction phenomena make one look for a more semantically based theory of weak islands. His suggestion that 'affective operators' play a role in extraction phenomena is illustrated by the following sentences:

(18) (a) How did Mary think that John behaved?
(b) How did every girl think that John behaved?
(c) How did most girls think that John behaved?
(d) *How did few girls think that John behaved?
(e) *How did no girl think that John behaved?

A semantically oriented theory which takes this type of phenomena as a starting point is developed by Szabolcsi and Zwarts (1991).

2. A semantic approach to extraction: monotonicity

Szabolcsi and Zwarts (1991) propose a semantic treatment of this type of intervention effects in categorial grammar. Their approach is based on Zwarts' (1986, 1990) analysis of negative polarity items (NPI's). The notion of monotonicity plays a crucial role in the analysis of NPI's. If a determiner establishes a relation Q between two subsets A and B of the universe of discourse U, we can define monotonicity in the right argument as follows:

(19) MON ↑ If Q_U AB and $B \subseteq B'$ then Q_U AB'
MON ↓ If Q_U AB and $B' \subseteq B$ then Q_U AB'

Right monotone increasing determiners are closed under supersets, monotone decreasing quantifiers are closed under subsets. Assuming that individuals which came home late is a subset of the individuals which came home, we can check the monotonicity properties of determiners as follows:

(20) MON↑
(a) All children came home late →
All children came home
(b) Some children came home late →
Some children came home
(c) Many children came home late →
*Many children came home

(21) MON↓
(a) No child came home →
No child came home late

(b) Not all children came home →
Not all children came home late
(c) Few children came home →
Few children came home late

For instance, the Dutch NPI *hoeven* is only triggered by mon↓ operators:

(22) (a) *Ieder kind zal zich hoeven verantwoorden [Dutch]
Every child will himself have to justify
'Every child will have to justify himself'
(b) *Veel kinderen zullen zich hoeven verantwoorden
Many children will themselves have to justify

(23) (a) Geen kind zal zich hoeven verantwoorden
No child will himself have to justify
(b) Weinig kinderen zullen zich hoeven verantwoorden
Few children will themselves have to justify

Szabolcsi and Zwarts require that the NPI be the argument of a function with the appropriate licensing properties. An intervening quantifier can block the inheritance of the licensing properties of the trigger under composition. Furthermore, they argue that the set of 'affective' operators, which block extraction can be characterized in terms of monotonicity. The examples under (18) make it clear that monotone increasing NPs do not block extraction, because they preserve inclusions relations. Monotone decreasing and non-monotone NPs, on the other hand, create weak islands:

(24) **Weak islands and Monotonicity** (WIM)
Upward monotonic contexts are good extraction domains. But paths that are not upward monotonic, viz., either downward monotonic or non-monotonic constitute weak islands

This hypothesis is intended to account not only for wh-extraction as in (18), but also for phenomena such as the French quantification at a distance construction. This requires us to study first the monotonicity properties of adverbs such as *beaucoup* and *souvent*.

In my dissertation (De Swart, 1991), I develop an interpretation of adverbs of quantification (Q-adverbs) as expressions which establish a relation Q between two subsets A and B of the domain of eventualities or situations E. The notions of eventuality or situation are meant to be generic terms for events, states, activities, processes, etc. (cf. Bach, 1986 and others). Right monotonicity can then be defined as follows:

(25) MON ↑ If Q_E AB and $B \subseteq B'$ then Q_E AB'
MON ↓ If Q_E AB and $B' \subseteq B$ then Q_E AB'

If we want to test right monotonicity properties of adverbs we have to keep A constant and take supersets respectively subsets of B. The easiest way to test monotonicity properties of Q-adverbs is to use *if..then* constructions. As Lewis (1975) points out, the *if*-clause functions as the restriction on the quantifier (=A) and the main clause gives us the second argument (=B):

(26) MON↑
(a) If she knits something, Anne always knits Norwegian sweaters →
If she knits something, Anne always knits sweaters
(b) If she knits something, Anne sometimes knits Norwegian sweaters →
If she knits something, Anne sometimes knits sweaters
(c) If she knits something, Anne often knits Norwegian sweaters →
If she knits something, Anne often knits sweaters

(27) MON↓
(a) If she knits something, Anne never knits sweaters →
If she knits something, Anne never knits Norwegian sweaters
(b) If she knits something, Anne does not always knit sweaters →
If she knits something, Anne does not always knit Norwegian sweaters
(c) If she knits something, Anne seldom knits sweaters →
If she knits something, Anne seldom knits Norwegian sweaters

As expected, mon↓ adverbial quantifiers, but mon↑ quantifiers do not function as triggers for the Dutch NPI *hoeven*:

(28) (a) Peter hoeft nooit een tentamen over te doen
Peter needs never to repeat an exam
(b) Peter hoeft zelden een tentamen over te doen
Peter needs seldom to repeat an exam
(c) *Peter hoeft altijd een tentamen over te doen
Peter needs always to repeat an exam
(d) *Peter hoeft vaak een tentamen over te doen
Peter needs often to repeat an exam

The monotonicity properties of frequency adverbs thus correlate in an interesting way with those of determiners. We would expect then, that the French quantification at a distance cases can be subsumed under the semantic generalization Szabolcsi and Zwarts (1991) formulated in (24) above. There are some problems, though.

If the monotonicity properties given under (26) and (27) for *often* and *seldom* are also those of *souvent/rarement* and *beaucoup/peu*, we have a problem. Monotone increasing quantifiers are supposed to create good extraction domains. If *souvent* and *beaucoup* are mon↑, they should not block extraction. Consequently, we would expect the sentences under (29) to be all right, but they aren't. There is no clear contrast between (29) and

(30), which involve the mon↓ decreasing quantifiers *rarement* and *peu*:

(29) (a) *Combien as-tu beaucoup consulté de livres?
How many have you a lot consulted of books
(b) *?Combien as-tu souvent consulté de livres?
How many have you often consulted of book

(30) (a) *Combien as-tu peu consulté de livres?
How many have you little consulted of books
(b) *?Combien as-tu rarement consulté de livres?
How many have you seldom consulted of books

It is not surprising, then, that Szabolcsi and Zwarts define *often, souvent* and *beaucoup* as non-monotonic quantifiers. But this is obviously in conflict with the inferences I gave under (26) and (27) to demonstrate that *often* is mon↑ and *seldom* is mon↓. In my view, the arguments Szabolcsi and Zwarts propose are not entirely convincing. When testing monotonicity properties of adverbs we have to make good use of the argument structure of the quantifier. We can only test right monotonicity if we keep A constant and take subsets respectively supersets of B. The example Szabolcsi and Zwarts discuss in their (1990) version is (31a). Although the inference does not go through, I do not think that *often* should be classified as a non-monotonic quantifier. Note that the inference is invalid for the *always* in (31b) as well:

(31) (a) John often sings in the bathtub -/→ John often sings
(b) John always sings in the bathtub ↛ John always sings

If we could trust these inferences to say something about monotonicity properties in the right argument, we would deduce from (31b) that *always* is a right monotone decreasing quantifier. This is obviously an undesirable conclusion, so (31) is not the kind of context to use in this case. A similar problem arises with respect to the French example in (32):

(32) (a) J'ai beaucoup conduit ce camion -/→
J'ai beaucoup conduit
I have a lot driven this truck -/→
I have a lot driven
(b) J'ai peu conduit ce camion -/→
J'ai peu conduit
I have little driven this truck -/→
I have little driven
(c) J'ai toujours conduit ce camion -/→
J'ai toujours conduit
I have always driven this truck -/→
I have always driven

Szabolcsi and Zwarts use (32a) to argue that *beaucoup* is a non-monotonic quantifier. But accepting this leads us into trouble, because (32b) and (c) show that the same context would imply that *peu* is no longer monotone decreasing and even *toujours* becomes non-monotone. Assuming that *toujours* is undoubtedly right monotone increasing (cf. 26a), this leads me to conclude that there is something wrong with the argument structure of the quantifier in (32), which makes it inappropriate as a context in which to test monotonicity properties. A context in which there are no problems concerning argument structure involves conjunction of predicates:

(33) (a) John is always singing and dancing →
John is always singing
(b) John is often singing and dancing ←/→
John is often singing
(c) John is seldom singing and dancing ←
John is seldom singing
(d) John is singing and dancing exactly twice a week ←/→
John is singing exactly twice a week

The entailment under (33a) is expected in view of the right monotone increasing character of *always*. According to Szabolcsi and Zwarts (1991), the inference under (33b) is invalid, because frequency standards are unstable. "E.g., it may be that to be both dancing and singing every other day counts as 'often', but to be just dancing every other day does not" (p. 27). Rather surprisingly, Szabolcsi and Zwarts claim that the inference under (33c) goes through, which classifies *seldom* as monotone decreasing. We would expect *seldom* to be just as sensitive to the context as *often* and consequently characterize it as a non-monotone quantifier. But then we would loose the semantic contrast between *often* and *seldom*, which makes it hard to understand why, in *if..then* contexts, *often* tends to pattern with mon↑ quantifiers (cf. 26c) and *seldom* with mon↓ ones (cf. 27c). Also, it does not explain why *few* and *seldom* trigger negative polarity items as in (23b) and (28b), whereas *many* and *often* do not (cf. 22b and 28d). Moreover, the reason why the inference is invalid in (33b) is quite different from the explanation for (33d). Expressions like *twice a week* are not context-sensitive, but they are really non-monotonic: if you are both singing and dancing exactly twice a week, it may well be that dancing alone you do seven times a week. This means that *exactly twice a week* need not take up a different interpretation before and after the arrow in order to block the entailment under (33d). This suggests again that context-sensitivity and non-monotonicity are two different things.

As far as the construction of quantification at a distance, is concerned, we are back at our starting point now. If *souvent* and *beaucoup* are no longer non-monotonic but monotone increasing, we would expect them not to block extraction. But then, why are the sentences under (29) unfelicitous? I conclude that monotonicity does not give us a good way to handle the problem. This means that we have to develop an alternative analysis of quantification at a distance. I will do this on the basis of an account of intervention effects in the Dutch *wat voor*-split. This analysis will show weak islands to be scope islands.

3. **An alternative semantic approach: scope**

3.1 **The *wat voor*-split**

Obenauer and Rizzi claim that splitting constructions such as the French quantification at a distance and the Dutch *wat voor*-split are quite similar, because both involve a prepositional group. Examples are given in (34):

(34) (a) Wat voor boeken heb je gelezen?
What for books have you read
'What kind of books did you read'
(b) Wat heb je voor boeken gelezen?
What have you for books read

At first sight, the *wat voor*-split seems to confirm Rizzi's hypothesis that A'-binders cannot occur in between the interrogative *wat* and the rest of the NP, whereas A-binders can, compare (35)/(36) and (37)/(38):

(35) (a) Wat voor boeken heeft iedereen gelezen?
What for books has everybody read
(b) Wat heeft iedereen voor boeken gelezen?
What has everybody for books read

(36) (a) Ik ben benieuwd wat voor smoes veel mensen nu weer hebben bedacht om hun huiswerk niet te hoeven maken
I am curious what for excuse many people have now again made up for their homework not to need make
(b) Ik ben benieuwd wat veel mensen nu weer voor smoes hebben bedacht om hun huiswerk niet te hoeven maken
I am curious what many people have now again for excuse made up for their homework not to need make

(37) (a) Wat voor boeken heb je veel gelezen?
What for books have you many read
(b) *Wat heb je veel voor boeken gelezen?
What have you a lot for books read

(38) (a) Wat voor boeken heb je (minstens) twee keer gelezen?
What for books have you read (at least) twice
(b) *Wat heb je twee keer voor boeken gelezen?
What have you twice for books read

We see that the A-quantifiers *iedereen* and *veel mensen* in (35) and (36) do not block extraction, whereas the A'-quantifiers *veel* and *(minstens) twee keer* in (37) and (38) do. This is not in accordance with the analysis of Szabolcsi and Zwarts propose, because all the quantifiers in (35)-(38) are classified as mon↑ and are thus expected to create good extraction domains. In particular, Szabolcsi and Zwarts would be unable to explain the contrast between (36) and (37), because they involve the same quantifier. But the A or A'-character of the quantifier is not the only difference between *iedereen/ veel mensen* and *veel/ twee keer*. A closer look at (35a) reveals that it has two readings, depending on the scope of the quantifier. Giving *iedereen* wide scope we ask for everyone which books he/she has read. This reading is easier to get if we stress the common noun. Under the narrow scope reading for the universal quantifier we ask which books are such that everyone has read them. The narrow scope reading is easier to get if we stress the universal quantifier, cf:

(39) (a) Wat voor BOEKEN heeft iedereen gelezen [∀ wide scope]
What for BOOKS has everybody read
(b) Wat voor boeken heeft IEDEREEN gelezen [∀ narrow scope]
What for books has EVERYBODY read

(35b) on the other hand is not ambiguous: it is hard not to give the universal quantifier wide scope over the books. In other words, the predominant reading of (35b) is the one corresponding to (39a): for every person we ask what kind of books he/she has read. Note that it is hard to stress *iedereen* in this construction. Accordingly, the narrow scope reading for the universal quantifier seems to be absent or pretty hard to obtain.

It is generally assumed that scopal relations have their roots in the syntactic structure. For a quantifier to take scope over an expression, it is usually claimed to be necessary for the quantifier to c-command this expression. If we look at the c-command relations in splitted and non-splitted constructions we observe a crucial difference. In the non-splitted (35a) *wat voor boeken* c-commands *iedereen* and *iedereen* c-commands the trace of *wat voor boeken*:

(40) [wat voor boeken$_i$]$_i$ .... [iedereen] .... t$_i$
c-command c-command

Given that the wh-expression and the quantifier c-command each other, we expect both scope relations to be possible. This prediction is borne out by the ambiguity of the sentence. As far as the splitted construction is concerned, though, *iedereen* still c-commands *boeken*, but not the other way round, at least if we assume that the constituent *wat voor boeken* bears the index of *boeken*, whereas *wat* does not bear that same index:

(41) $[\text{wat}]_j \ldots\ \underbrace{[\text{iedereen}] \ldots [t_j \text{ voor boeken}_i]_i}_{\text{c-command}}$

Given that *iedereen* c-commands the NP left behind, it can take scope over it. Given that the wh-expression (i.e. the NP as a whole) does not c-command the quantifier, it cannot take wide scope. Consequently, *iedereen* must take scope over the wh-phrase because of syntactic constraints and the sentence is not ambiguous.[2]

A more semantically oriented explanation for the wide scope readings of intervening quantifiers is provided by the quantifying-in mechanism common to proposals developed in Montague grammar. In-quantification is used to give a quantifier which would normally be embedded under another operator wide scope over that operator. In-quantification gives the intervening quantifier wide scope over the wh-phrase so that it is interpreted independently of the splitted construction:

(42) Wat heeft iedereen voor boeken gelezen S
/ \
Iedereen T Wat heeft x voor boeken gelezen IV

In this view, the quantifier is in fact outside the function-argument structure used for the interpretation of the wh-phrase. There is only a variable x intervening, which, just like a proper name, does not block the link between the moved wh-phrase and the part of the NP left behind. Narrow scope readings, on the other hand, cannot be interpreted as if they were outside the relation between the wh-phrase and the part of the NP left behind, because they are subordinate to the wh-quantifier. As such, they are really intervening in an infelicitous way, which explains why they block extraction.

Returning now to (37a) and (38a), we observe that the non-splitted constructions here are not ambiguous. For some reason or another, *veel* and *twee keer* can only take narrow scope with respect to the interrogative *wat voor*: we ask which books are such that you have read them a lot/ at least twice. Given the ambiguity of (35a), this can hardly be due to a syntactic constraint on the interpretation. Therefore, I will assume that the semantic character of the quantifier is responsible for it. (37b) and (38b) show that *veel* and *twee keer* do not occur in between *wat* and the rest of the interrogative NP. We could explain this in Rizzi's way by appealing to the A'-character of *veel* and *twee keer*, but we could also assume that it is related to the fact that iterative adverbs such as *veel* and *twee keer* always take narrow scope with respect to a wh-expression. We can then go on to claim that this is not appropriate in a splitting construction. The latter hypothesis is confirmed by (43):

---

[2] Thanks to Eric Hoekstra for pointing this out to me.

(43) (a) Wat voor boeken heeft niemand gekocht
What for books has nobody bought
(b) *Wat heeft niemand voor boeken gekocht
What has nobody for books bought

Niemand is an A-binder, just like *iedereen*, so Rizzi's theory would predict it to be a harmless intervener. Still, it yields bad results when it is placed in between *wat* and *voor boeken*. Szabolcsi and Zwarts would explain this by appealing to the mon↓ character of the quantifier. But as we saw in (35)-(38) already, monotonicity does not always explain the extraction possibilities in this context. Looking at the scope properties of the negative quantifier, we realize that it always takes narrow scope with respect to the wh-phrase. The non-splitted (43a) is not ambiguous: it only asks for the books x which are such that nobody bought x. We cannot use (43a) to ask for nobody which books he bought. In other words, at least in this context, there is no wide scope reading available for the negative quantifier. Now Kiss (1990) observes that negation takes narrow scope with respect to a wh-phrase. The absence of a narrow scope reading for (43a) suggests that this observation can be extended to mon↓ quantifiers in general. Although the syntax allows for two scope configurations, one of these is ruled out for independent - i.e. semantic - reasons. If this is on the right track, we can relate the ungrammaticality of the intervening negative quantifier in (43b) to the prohibition against narrow scope readings in split constructions.

Let us now turn to A'-binders in order to see whether a similar generalization holds. We observe that Rizzi is not right in his claim that no A'-binder can intervene between *wat* and the rest of the NP:

(44) Wat heb je gisteren voor boeken gekocht?
What have you yesterday for books bought

Gisteren is an A'-binder, so Rizzi would predict the splitting construction to be out, but it isn't. In order to save the analysis and explain this kind of transparencies, he appeals to a notion of specificity. *Gisteren* is indeed a very specific quantifier, and it could be true that such specific A'-quantifiers are transparent in a sense and do not block extraction. But due to its specificity, *gisteren* also takes wide scope, so it is unclear which one of the analyses gives the best explanation. A contrast between Rizzi's generalization and mine can be obtained by studying non-specific A'-binders. We know that Rizzi's hypothesis is invalidated if we find a non-specific A'-binder, which does not block extraction, because it takes wide scope. This is what we observe in the following examples, which may be contrasted with (37) and (38). (The examples are best if read with an accent on *jij* ('you')):

(45) (a) Wat voor boeken lees jij meestal?
What for books read you mostly
(b) Wat lees jij meestal voor boeken?
What read you mostly for books

(46) (a) Wat voor brood eet jij altijd?
What for bread eat you always
(b) Wat eet jij altijd voor brood?
What eat you always for bread

(47) (a) Wat voor appels gebruik jij vaak wanneer je een appeltaart maakt?
What for apples use you often when you an applepie make
'What kind of apples do you often use when you make an applepie'
(b) Wat gebruik jij vaak voor appels wanneer je een appeltaart maakt?
What use you often for apples when you an applepie make

(48) (a) Wat voor wasmiddel gebruikte jij altijd (voordat product X op de markt kwam)
What for detergent used you always (before product X on the market came)
(b) Wat gebruikte jij altijd voor wasmiddel (voordat product X op de markt kwam)
What used you always for detergent (before product X on the market came)

Rizzi would predict (45b), (46b), (47b) and (48b) to be out, because there is no particular reason to characterize the A'-binders *altijd*, *meestal* and *vaak* as specific. But if the scope generalization holds for A'-binders as well, they are all right, because we can give the quantifying adverb wide scope over *wat voor* N. An appropriate answer to (45) would be 'I usually read detectives', to (46) 'I always eat white bread' and to (47) 'I often use Granny Smith apples'. The facts under (45)-(48) suggest that the scope possibilities of the quantifier are more important than its A- or A'-character. Note moreover, that monotone decreasing quantifiers block extraction in a systematic way:

(49) (a) Vertel me eens wat voor mensen jij niet altijd uit zou nodigen
Tell me what for people you not always would invite
'Tell me what kind of people you would not always invite'
(b) *Vertel me eens wat jij niet altijd voor mensen uit zou nodigen
Tell me what you not always for people would invite

(50) (a) Wat voor boeken raadpleeg jij zelden?
What for books consult you seldom
'What kind of books do you seldom consult'
(b) *Wat raadpleeg jij zelden voor boeken?
What consult you seldom for books

The ungrammaticalities in (49) and (50) can be explained by invoking their mon↓ character, as Szabolcsi and Zwarts do. Keeping in mind, though, that monotonicity is related to scope, we can also appeal to the latter notion to explain why mon↓ quantifiers create bad extraction domains. Just as we expect, the mon↓ quantifiers in (49a) and (50a) only allow for a narrow scope reading with respect to the wh-phrase. For instance, (50a) asks which books are such that you seldom consult them and cannot mean that one asks, for rare situations, which books you consult. Given that they do not take wide scope with respect to the wh-phrase, quantifiers like *niet altijd* and *zelden* cannot intervene between *wat* and *voor mensen/boeken*.

So the Dutch *wat voor*-split confirms one half of Szabolcsi and Zwarts' observation, namely that mon↓ quantifiers create islands and block extraction. In order to account for the intervention effects in the *wat voor*-split, I propose the following hypothesis for A and A'-operators alike:

(51) Hypothesis (syntactic formulation):
In a construction:

$Q_{2j} \ldots Q_1 \ldots [_{NP} [_{QP}\ e_j\ [\text{ prep N }]$

Q_2 cannot take wide scope over Q_1

We do not need to restrict the hypothesis explicitly to mon↑ quantifiers if we assume that mon↓ quantifiers always take narrow scope with respect to the wh-phrase. A more semantic formulation imposes restrictions on the separation by a quantifier Q_1 of another quantifier Q_2 and its restrictive clause (i.e. the part of the sentence which provides the first argument of the quantifier). The following semantic formulation is equivalent to (51):

(52) Hypothesis (semantic formulation): A quantifier Q_1 can only separate a quantifier Q_2 from its restrictive clause if Q_1 has wide scope over Q_2 (or is scopally independent from Q_2)

The scope hypothesis functions as a starting point for the analysis of the intervention effects in the French quantification at a distance construction.

3.2 Quantification at a distance in French again

Returning to the French examples, we may wonder whether scope plays a role in the quantification at a distance construction as well. Rizzi would probably appeal to the difference between A and A'-binders to account for the contrast between (53) and (54):

(53) (a) Combien de livres ont-ils tous lus?
How many of books have they all read
(b) Combien ont-ils tous lu de livres?
How many have they all read of books

(54) (a) Combien de livres a-t-il beaucoup lus?
How many of books has he a lot read
(b) *Combien a-t-il beaucoup lu de livres?
How many has he a lot read of books

This does not mean that Szabolcsi and Zwarts have nothing to say about extraction in French. (55) and (56) confirm the idea that mon↑ quantifiers create good extraction domains, whereas mon↓ operators do not:

(55) (a) Combien Jean a-t-il a acheté de livres?
How many Jean has he bought of books
(b) Combien est-ce que chaque étudiant a acheté de livres?
How many WH-PART every student has bought of books[3]
(c) Combien est-ce que la plupart des étudiants ont acheté de livres?
How many WH-PART most of the students have bought of books
(d) ?Combien est-ce que beaucoup d'étudiants ont acheté de livres?
How many WH-PART many of students students have bought of books

(56) (a) *Combien est-ce qu'aucun étudiant n'a acheté de livres?
How many WH-PART no student NEG has he bought of books
(b) *Combien est-ce que peu d'étudiants ont acheté de livres?
How many WH-PART few of students students have bought of books

Although (55d) is less acceptable than (55a-c), (56b) is clearly felt as worse.[4] The general pattern is then that mon↓ quantifiers always block extraction, whereas mon↑ quantifiers are transparent, but under certain conditions only. This suggests that there are differences between *tous* and *beaucoup*, which neither Rizzi, nor Szabolcsi and Zwarts take into account.

---

[3] The phrase *est-ce que* has no meaning, except for indicating that this is an interrogative construction. Therefore, it is glossed as a wh-particle (WH-PART).

[4] The contrast between (55b) and (56a) is stronger than the one between (55d) and (56b). This is not surprising in view of the discussion of 'gradience' in Szabolcsi and Zwarts (1991). They point out that quantifiers like *the* N, *every* N, *most* N, *two* N give better extraction results than *at least* N or *many* N. They suggest that this is related to the fact that universal quantifiers *every* and (generic) *most* preserve inclusions and (finite) intersections.

A closer look at (53a) reveals that the sentence is ambiguous, just like (35a) above. The universal quantifier can take wide scope so that we ask for all persons how many books they have read. Under the narrow scope reading we ask how many books are such that everyone has read them. In (53b), however, the narrow scope reading of the universal quantifier seems to be absent. The sentence only allows for an interpretation in which we ask for all persons which books they have read.

(54a) on the other hand is not ambiguous: the quantifier *beaucoup* only allows for a narrow scope reading with respect to the interrogative *combien de livres*, just like *veel* did in (37) above. Assuming that hypothesis (51)/(52) is valid for the French case as well, we can explain why (54b) is ungrammatical. We can strengthen our position by studying the behaviour of other A'-binders. Rizzi would predict them all to forbid quantification at a distance. If scope is the crucial issue, we would expect narrow scope readings of the quantifier to give rise to ungrammaticalities as in (54b) and wide scope readings to be acceptable. Acceptable wide scope readings are exemplified in (57) and (58):

(57) (a) Combien d'enfants as-tu toujours voulu avoir?
How many of children have you always wanted to have
(b) Combien as-tu toujours voulu avoir d'enfants?
How many have you always wanted of children

(58) (a) Combien de toasts prépares-tu généralement pour le petit déjeuner?
How many of toasts prepare you generally for breakfast
(b) Combien prépares-tu généralement de toasts pour le petit déjeuner?
How many prepare you generally of toasts for breakfast

Rizzi would predict (57b) and (58b) to be out, because they involve an A'-binder. Under the scope hypothesis, (57b) and (58b) are all right, because we can give the adverb wide scope over *combien de* N. An appropriate answer to (57) would be 'I have always wanted to have six children' rather than 'There are six children I have always wanted to have' and to (58) 'I generally prepare three toasts for breakfast' rather than 'There are three toasts which I generally prepare for breakfast'. So in this context, a wide scope reading of the adverb is preferred, even in the non-split construction.

Extraction is blocked for monotone decreasing quantifiers as usual:

(59) (a) Dis-moi combien de livres de Zola tu n'as jamais encore lu?
Tell me how many of books of Zola you NEG have never yet read

(b) *Dis-moi combien tu n'as jamais encore lu de livres de Zola?
Tell me how many you NEG have never yet read of books of Zola

We observe that negative quantifiers do not get scope over the wh-phrase. If intervening quantifiers have to take wide scope over the wh-phrase, this rules out all mon↓ expressions. Again, this shows that one half of Szabolcsi and Zwarts' descriptive generalization is true for the quantification at a distance cases: mon↓ quantifiers block extraction and create islands. As far as monotone increasing quantifiers are concerned, extraction clearly depends on the scope of the intervening quantifier. We may conclude that the scope hypothesis developed for the Dutch *wat voor*-split in section 3.1 accounts for the French quantification at a distance cases as well.

4. Conclusion on weak islands and scope

Now the question obviously arises why mon↓ quantifiers and iterative adverbs always take narrow scope with respect to a wh-expression. Note that with respect to other operators these expressions can take wide scope:

(60) (a) Not every child brought a present
(b) Nobody knows everything
(c) The president of this association has been killed several times

This means that we cannot claim that for mon↓ quantifiers and iterative adverbs wide scope readings are excluded in general. On the other hand, the comparison between iterative and frequentative adverbs reveals some differences in scope possibilities. For instance frequency adverbs can take scope over sentence initial *if/when*-clauses, but iterative adverbs cannot:

(61) (a) When Anne came in, Paul usually greeted her ≈
In most situations in which Anne came in, Paul greeted her
(b) When Anne came in, Paul greeted her twice ≉
In two situations in which Anne came in, Paul greeted her

In general then, it seems that the scope possibilities of iterative adverbs are more restricted than those of frequency adverbs. Kiss (1990) mentions the scope properties of negation as an observation and she does not provide an explanation for its behaviour. Her claim is that wide scope quantifiers must be specific in the sense of Enç (1991). Enç argues that specific quantifiers can take either wide or narrow scope, whereas non-specific quantifiers are restricted to narrow scope. Enç and Kiss do not explain, however, why a negative quantifier like *nobody* can be specific and take wide scope with respect to *everything* as in (60b), whereas it must take narrow scope with respect to a wh-expression, as we saw in (43). Also, analyses which rely on notions such as specificity, referentiality or discourse-linking do not offer much hope for an explanation of the differences observed between iterative and frequency adverbs. Why would frequency adverbs such as *often*, *always* be specific (referential, d-linked, etc.) whereas iterative adverbs like *veel*, *twee keer* would be obligatorily non-specific (non-referential, non d-linked, etc.)? Whichever explanation we choose to give of the scope possibilities of natural language quantifiers, it should be formulated in such a way that it is not only valid for NPs, but can be extended in a natural way to other quantificational expressions, such as adverbs. I will leave this open for further research and refer to Szabolcsi (this volume) for more discussion of this issue.

References

Bach, E. 1986. The algebra of events, *Linguistics and Philosophy* 9:5-16.

Kayne, R. 1984. *Connectedness and binary branching*, Dordrecht: Foris.

Kiss, E. 1990. Against the LF movement of wh-phrases, ms. Budapest.

Obenauer, H. 1976. *Etudes de syntaxe interrogative du français*, Tübingen: Niemeyer.

Obenauer, H. 1984. On the identification of empty categories, *The linguistic review* 4: 153-202.

Rizzi, L. 1990. *Relativized Minimality*, Cambridge: MIT press.

Sportiche, D. 1988. A theory of floating quantifiers and its corollaries for constituent structure, *Linguistic Inquiry* 19: 425-449.

De Swart, H. 1991. *Adverbs of quantification: a generalized quantifier approach*, Diss. University of Groningen.

Szabolcsi, A. and F. Zwarts 1990. Semantic properties of composed functions and the distribution of wh-phrases in: M. Stokhof and L. Torenvliet (eds.). *Proceedings of the seventh Amsterdam Colloquium*, Amsterdam: ITLI, 529-553.

Szabolcsi, A. and F. Zwarts. 1991. *Unbounded dependencies and algebraic semantics*, Lecture notes from the third European summer school in language, logic and information, University of Saarbrücken.

Zwarts, F. 1986. *Categoriale grammatica en algebraïsche semantiek*, Diss. University of Groningen.

Zwarts, F. 1990. The syntax and semantics of negative polarity, in: S. Busemann e.a. (eds.). *Views on the syntax-semantics interface* II, Berlin.

Henriëtte de Swart
Cognitive Science/Dutch Linguistics
University of Groningen
P.O. box 716
9700 AS Groningen
the Netherlands
deswart@let.rug.nl

Weak islands, individuals, and scope [*]

Anna Szabolcsi
University of California at Los Angeles

This paper outlines a semantic approach to weak islands, a phenomenon that has traditionally been thought of as purely syntactic. Weak islands are environments that allow some, but not other, wh-phrases to extract. E.g.,

(1) Which man$_i$ are you wondering [whether to invite $-_i$]?
(2) * How$_i$ are you wondering [whether to behave $-_i$]?

Two proposals will be considered. The first was developed in Szabolcsi and Zwarts (1990, 1991). It took the syntactic theory of Relativized Minimality as a point of departure, and reinterpreted its generalizations as follows:

(3) Wh-phrases that are sensitive to weak islands are the ones that range over partially ordered domains, rather than discrete individuals.

(4) Weak islands are environments in which the interveners between the wh-phrase and its trace cannot be composed into an upward monotone function.

(5) The link between (3) and (4) is that only upward monotone functions preserve partial ordering.

This proposal, in particular (4) and (5), has certain descriptive and conceptual shortcomings, however. These point to a revision in terms of scope. The characterization of island-sensitive phrases in (3) is retained, but its significance is explicated in terms of the impoverished structure semi-lattices have.

(6) The weak island effect comes about when the wh-phrase should take wide scope over some operator but it is unable to.

(7) For a wh-phrase to take wide scope over another scope bearing element SBE means that operations associated with SBE need to be performed in the domain of wh in order to compute an answer. When a wh-phrase ranges over discrete individuals, these can be collected into unordered sets. All Boolean operations can be performed on sets. When a wh-phrase does not range over discrete

---

[*] This research is part of a larger project with Frans Zwarts. I wish to thank him, D. Ben-Shalom, I. Heim, J. Higginbotham, M. Krifka, A. Ojeda, B. Partee, D. Pesetsky, B. Schein, H. de Swart, Z. Szabó, and members of the UCLA Linguistics community for recent discussions. All errors are my own.

individuals, only a smaller set of operations (possibly none) are available in its domain, hence answers cannot be computed in the general case.

(8) Harmless interveners are harmless only in that they can give rise to at least one reading that presents no scopal conflict of the above sort: they can 'get out of the way'. But even they create an island effect if the sensitive wh-phrase has to expressly take scope over them.

The paper is organized as follows. Section **1** reviews the core weak islands data, and outlines the accounts in Rizzi (1990) and Cinque (1991) on the one hand and in Szabolcsi and Zwarts (1990, 1991) on the other. Section **2** explains the notion of individuals on which both the latter proposal and its subsequent revision are based. Section **3** summarizes the monotonicity account and points out its problematic aspects. Section **4** proposes an alternative account in terms of scope. The present paper focuses on why non-individual wh-phrases do not take wide scope. **5.1** is concerned with claim (7). **5.2** introduces a novel set of data involving arguments of non-iterable predicates that support this account over ones in terms of discourse or thematic roles. **5.3** establishes a connection between event structure and whether the predicate denotes an ordered or an unordered set.

1.1 Weak island facts and Relativized Minimality

Islands for extraction come in two varieties. STRONG ISLANDS are absolute: they do not allow any wh-phrase to escape. Cinque (1991) argues that subject, complex NP, and adjunct islands belong here: the NP gap they may contain is an empty resumptive pronoun, not a trace. WEAK ISLANDS, on the other hand, are selective: typically, phrases like *which man* can extract, but phrases like *why*, *how*, and *how many pounds* cannot. The cross-linguistically best known weak islands are infinitival/subjunctive/modal *whether*-clauses:

(9) a. Which man$_i$ are you wondering [whether to invite -$_i$]?
b.* How$_i$ are you wondering [whether to behave -$_i$]?
(10) a. Welke man$_i$ vraag jij je af [of je -$_i$ uit moet nodigen]?
'Which man are you wondering whether you should invite?'
b.* Hoe$_i$ vraag jij je af [of je -$_i$ moet gedragen]?
'How are you wondering whether you should behave?'

Extraction from embedded constituent questions is degraded or unacceptable for many speakers of English. In other languages these may either be strong islands (Dutch) or genuine weak islands (Hungarian):

(11) ?/* Which man$_i$ are you wondering [who saw -$_i$]?
(12) * Welke man$_i$ vraag jij je af [wie -$_i$ gezien heeft]?
'Which man are you wondering who saw?'
(13) Melyik embert$_i$ találgattad, [hogy ki látta -$_i$]
which man-acc were-you-guessing that who saw

Although the variation in (11) through (13) is not well-understood, I will follow standard practice both in assuming that the strong islandhood of certain wh-complements is syntactic in nature and in restricting my attention to examples that qualify as weak islands in the given dialect or language.

Drawing from work by Obenauer and Ross, Rizzi (1990) and Cinque (1991) observe that the same kind of selectivity is exhibited by many further environments: the presence of *beaucoup*, negation or negative quantifiers, *only*phrases, adversative and factive predicates, and extraposition all create weak islands:

(16) a. Quel livre as-tu beaucoup consulté -?
what book have-you a lot consulted
b.* Combien as-tu beaucoup consulté - de livres?
how-many have-you a lot consulted of books
(17) a. Which man didn't you / did no one think that I invited -?
b.* How didn't you / did no one think that I behaved -?
(18) a. Which man did only John think that I invited -?
b.* How did only John think that I behaved -?
(19) a. Which man did you deny / regret that I invited -?
b.* How did you deny / regret that I behaved -?
(20) a. Which man was it a scandal that I invited -?
b.* How was it a scandal that I behaved -?

Compare the following good *how*-extraction:

(21) How did everyone / two men think that I behaved -?

They propose the following uniform explanation for the contrasts in (9) and in (16) through (21):

(22) Referential wh-phrases can be long-distance linked to their traces via referential indices; non-referential wh-phrases need to be linked to their traces via an (antecedent-) government chain.
(23) The government chain between a non-referential wh-phrase and its trace is broken (i) by certain INTERVENERS, or (ii) if the clause from which we extract is not sister of a theta-marking [+V] head.
(24) REFERENTIAL wh-phrases are those that both bear a thematic role like Agent, Patient, etc. and are Discourse-linked; NON-REFEREN-

TIAL wh-phrases are those that bear a role like Reason, Manner, Measure, etc. or are not D-linked.

The majority of the weak island effects is attributed to (23i). What interveners break the government chain between the *how*-type phrase and its trace? Rizzi's answer is in terms of syntactic positions. Developing the theory of Relativized Minimality, he argues that since the extracted wh-phrase is in an A-bar specifier position, all and only intervening A-BAR SPECIFIERS count as relevant interveners. A-bar specifiers are phrases in a (non-adjoined) position where they do not receive thematic role and/or case. They contrast with complements, A-specifiers, heads, and adjoined phrases. Rizzi analyzes *whether, who, beaucoup, not, no one, only John* and *deny* as A-bar specifiers, at S-structure or at LF. In contrast, he points out that *everyone* or *two men* acquire their scope by adjunction according to May (1985), so they are predicted not to block non-referential extraction. Cinque adds that factive and extraposition islands are due to (23ii).

As regards referentiality, Rizzi draws the crucial line between those phrases that refer to participants of the event and those that do not; the latter are claimed never to be able to escape from weak islands. Drawing from Pesetsky's (1987), Comorovski's (1989), and Kroch's (1989) work, Cinque adds that even event participants have to be Discourse-linked, i.e., refer to specific members of a PREESTABLISHED SET, to be referential. Phrases differ in their ability to admit of a D-linked interpretation, so a scale is predicted:

(25) a. Which man do you regret that I saw -?
b.? Who do you regret that I saw -?
c.?? What do you regret that I saw -?
d.?? How many books do you regret that I saw -?
e.* How much pain do you regret that I saw -?
f.* Who the hell do you regret that I saw -?

1.2 Reinterpreting Relativized Minimality in semantic terms

Szabolcsi and Zwarts (1990, 1991) -- henceforth Sz&Z -- accept the above empirical generalizations and propose to reinterpret them in semantic terms. The motivation is three-fold. First of all, the data have a tempting semantic flavor. Second, certain problems with Rizzi's and Cinque's specific claims can be overcome if the generalizations are stated in semantic terms. Third, there is a theoretical challenge. The Relativized Minimality account makes essential reference to traces. Does the weak island phenomenon indeed make traces indispensable, or can it be accounted for in a way that is neutral between theories with and without traces?

The main claims in Sz&Z are as follows. The distinction between good extractors and bad extractors can be characterized in denotational terms. The former range over INDIVIDUATED domains, the latter over domains whose elements exhibit a PARTIAL ORDERING (inclusion relations). Discourse context plays a role only in that it may individuate things that are normally partially ordered; this is an important but ancillary role. I will call good extractors 'individuals', regardless whether their individuation is inherent or contextual. The characterization of weak islands can be given in terms of the MONOTONICITY properties of the items intervening between the extractor and its trace. Downward monotone and non-monotone interveners block the extraction of non-individuals; upward monotone ones are harmless. The connection lies in the fact that only the upward monotone environments PRESERVE partial ordering. Since individuals are not partially ordered, they are not interested in whether order is preserved: they must be insensitive to weak islands. Non-individuals are partially ordered, so they can naturally require that the structure of their domain be preserved between the extraction site and the landing site.

These claims can be implemented in a grammar whether or not it has movement and traces. For instance, they can be expressed as a condition on wh--trace relations. Or, they can be implemented in a categorial grammar that handles extraction using FUNCTION COMPOSITION: [1]

(26) How much milk did(*n't) you drink

$S/(S/NP)_{MON\uparrow}$ ---------------------------compose

$(S/NP)_{MON\uparrow}$

--apply

S

Assume that *how much milk* is marked to apply to an expression of category S/NP only if it denotes an upward monotone function. This assumption is methodologically analogous to (in fact, is inspired by) Zwarts' (1986) claim that negative polarity items must be arguments of downward monotone functions. Categorial grammar assembles form and meaning simultaneously. Since monotonicity properties are inherited under composition, *did you drink* will be upward monotone, whereas *didn't you drink* will inherit downward monotonicity from *n't*.

In the following sections I discuss the empirical motivation for these claims in some detail, and then go on to point out some problematic aspects.[2]

---

[1] If the extracted phrase is an adjunct, a functor looking for it is created by lifting the category to be modified by it.

[2] The combinatory grammars in Steedman (1987) and Szabolcsi (1992) have nothing to say about island constraints. To remedy this, Hepple (1990) introduces boundary modalities and what may be called a calculus of opacity. But he makes no empirical claims concerning what domains will be opaque for what relations,

2. Individuation: semantics versus pragmatics

Consider a sample of wh-phrases: (i) *which person(s)*, (ii) *who*, (iii) *what, how many men*, (iv) *who/what the hell*, (v) *how many pounds, how much attention, how tall, how, why*. Although the majority of scholars working on the subject do not examine the full sample, there is agreement that the phrases in (i) and (ii) extract most easily, and those in (iv) and (v) least easily, from weak islands. Furthermore, there is agreement that various degrees of contextualization enable practically any wh-phrase, save for *why*, to extract. The question is what distinguishes good and bad extractors and, in particular, what role contextualization plays. The arguments to be put forth in this section are consonant with Sz&Z but are significantly more elaborate.

I argue that the crucial distinction is between wh-phrases that range over individuals and those that do not. I use the term individual to refer both to entities like John and Mary that are inherently discrete and to those, typically higher order, objects whose overlaps and complements we expressly choose to ignore. INDIVIDUALS can naturally be collected into UNORDERED SETS. ('Unordered' sets of course contrast with sets whose members exhibit inclusion relations and not with ordered tuples.) NON-INDIVIDUALS are then characterized by the fact that they exhibit a PARTIAL ORDERING, and this ordering is in fact taken seriously.

The present notion of individuals is as in Szabolcsi (1983), a discussion of the focusing of common nouns in Hungarian in Montague Grammar. The construction in (27) represents a split indefinite, rather than a partitive (see van Riemsdijk (1987) for German). The sentences are equally good with or without a numeral; in the latter case they mean 'at least one of'.

(27) a. **Mit** látott Mari (hármat)?
what+acc saw Mary three+acc
'What did Mary see (three of)?'

b. **Biciklit** látott Mari (hármat).
bike+acc saw Mary three+acc
'It was bikes and nothing else that Mary saw (three of)'

Common nouns denote properties with natural overlaps and complements. If these all are honestly taken into account, (27b) cannot be interpreted as a sensible ex-

---

and why. The present paper tries to argue on empirical grounds that some of the island constraints are semantic in nature. It remains to be seen whether boundary modalities can encode the semantic generalizations or become, at least in this case, superfluous.

haustive answer.[3] Instead, properties need to be individuated: a set of relevant properties must be distinguished and Boolean operations disallowed. (In real life, the felicity of (27) does not require an explicit list of relevant properties; the existence of some criterion of relevance is sufficient.) Notice that once we make this move, it does not matter whether the co-relevant properties actually overlap: as we cannot intersect them, we cannot 'see' their overlaps.

This procedure might be subsumed under contextualization: *mi* 'what' now ranges over members of some salient set. What I wish to stress here is that *mi* can only do this if we make the strictly semantic move of collecting properties into an unordered set, i.e., if we expressly ignore the ordering that is otherwise vital to them. The same semantic change takes place when we have strong D-linking in the sense that the salient set is given as a checklist. Thus both pragmatics and semantics are involved in individuation. My explanation of the weak island phenomenon will rest on the semantic aspect.

Let us first see how the core examples can be described in terms of the individual versus non-individual (ordered) distinction. Wh-phrases like *which person* can easily be taken to range over individuals (plural *which persons*, too, as long as the predicate is distributive; certain non-distributive cases will be taken up later). *Who* and, especially, *what* can range over not only individuals but also properties; the latter are ordered, see above. *How many N*-phrases have an individual interpretation but, like *how many pounds* and *how much attention*, also an amount interpretation. Amounts can only be made sense of in terms of an ordering. The individual/amount ambiguity of numeral phrases is highlighted by the presence or absence of copula agreement in Italian clefts (I owe the observation to Filippo Beghelli). The agreeing version (a) is insensitive to weak islands, the non-agreeing version (b) is sensitive:

(28) a. Sono cinque donne che non ho invitato.
'There are five women who I didn't invite'
b.* È cinque donne che non ho invitato.
'The number such that I didn't invite that many women is five'

In French, *combien*-extraction unambiguously invokes the amount interpretation, although it is not a necessary condition for it:

(29) a. Combien as-tu (*beaucoup) consulté de livres?
b. Combien de livres as-tu (beaucoup) consulté?
c. Combien de cercles as-tu (*beaucoup) dessiné?
'How many circles did you draw a lot? [* unless types]'

---

[3] Rooth (1984) recognizes the same problem in connection with verbal focus.

Dobrovie-Sorin (1991) provides interesting evidence from Romanian that a *how many*-phrase has three distinct interpretations: amount, non-D-linked individual, and D-linked individual. D-linked animate direct objects in Romanian are clitic-doubled (c). The following contrasts show that 'how many women' on the amount interpretation cannot extract from a factive island (a), but on the individual interpretation it can extract even if it is not D-linked, i.e., not clitic doubled (b):[4]

(30) Cîte femei regreţi câ ai iubit?
a.* 'For what number, you regret having loved that number of women?' (answer: Three.)
b. 'How many women are there such that you regret having loved them?' (answer: There are three such women.)
c. Pe cîte femei regreţi câ le ai iubit?
'How many [=which] of the women do you regret having loved?'
(answer: Three, namely, A, B, and C.)

Why requires a propositional answer, and propositions are ordered by entailment, a special case of inclusion. It seems that manners, the domain of *how*, are also ordered; in particular, the components of the manner characterizing each event do not form a set but a sum. This intuition can be corroborated by using *only* as a test. *Only* has two interpretations: 'exclusively' and 'merely'. The first applies to elements of unordered sets, the second to elements of ordered ones. They may differ in their syntax (see Harada and Noguchi 1992); some languages even have different words for the two:

(31) a. John visited London only in 1953 and 1961.
'exclusively; German *nur*'
b. John's son was born only in 1990.
'merely, recently; German *erst*'
(32) a. Er zijn *alleen* drie stoelen in de kamer.
'There are only three chairs (and nothing else) in the room'
b. Er zijn *slechts* drie stoelen in de kamer.
'There are only three chairs (and no more) in the room'

Frans Zwarts observes that Dutch *alleen* means 'exclusively' and *slechts* 'merely'. It can thus serve to diagnose adverbs:

(33) a.* Hij loste het probleem om 2:00 alleen elegant op.
'He solved the problem at 2:00 only [=exclusively] elegantly'

---

[4] Dobrovie-Sorin (1991) makes the crucial distinction in terms of restricted versus non-restricted quantification.

b.? Hij loste het probleem om 2:00 slechts elegant op.
'He solved the problem at 2:00 only [=merely] elegantly'
c. Hij loste het probleem om 2:00 slechts met tegenzin op.
'He solved the problem at 2:00 only [=merely] reluctantly'
d. Zijn hele leven, loste hij problemen alleen/*slechts elegant op.
'In all his life, he solved problems only [=exclusively] elegantly'

(33a) with *alleen elegant* is unacceptable because the components of the manner in which the problem was solved on a particular occasion do not form a set; *alleen elegant* cannot mean 'of all manners, only elegantly'. (33b) with *slechts elegant* is somewhat strange, since elegance is towards the high end of the scale; (33c) with *slechts met tegenzin* is fine, since reluctance is towards the low end. (33d) switches to a bare plural object, whence we have a plurality of problem-solving events. Each has a manner of its own, and these manners as wholes can be collected into a set. Here *alleen elegant* can be used: it means that the manner of every problem-solving was elegant. The judgments are the same for the English counterparts. There is a corresponding improvement in extracting abilities:

(34) a.* In what way didn't you solve the problem at 2:00?
b. In what way did you never solve problems?

(34a) may be acceptable, too, if the manner domain is turned into an unordered set by the brute force of D-linking, i.e., by providing an explicit list of manners to check and to report on each in the answer.

The next question to ask is whether there are other cases that make invoking D-linking truly indispensable. *Wh-the-hell* expressions are a good candidate. Since Pesetsky (1987) it has been assumed that they form minimal pairs with their plain counterparts in that they are 'aggressively non-D-linked', whereas plain wh-phrases are D-linkable. They seem to make a strong case for D-linking since they extract markedly less that their counterparts, e.g.,

(35) a. Who are you wondering whether to invite?
b.?? Who the hell are you wondering whether to invite?

I wish to argue that D-linkability is not a minimal difference between *wh-the-hell* expressions and their plain counterparts. Consider the following pair:

(36) a. Who saw John on the way home?
b. Who the hell saw John on the way home?

Let us ignore the rhetorical or cursing uses of (36b). Even so, the contexts in which the two questions are usable are not the same. The existential presupposition wh-questions carry does not prevent (36a) from being an open question, readily answerable by *Nobody*. (36b) on the other hand can only be asked if we have unquestionable evidence that someone saw John, and merely wish to identify the person(s). The strength of this requirement is illustrated by a context I owe to Bruce Hayes. When asked what a felicitous use of *Who the hell saw his mother?* would be, he answered, 'If we know that whenever someone sees his mother, God sends purple rain, then upon seeing purple rain, I can ask, Who the hell saw his mother?' Now, lacking the institution of purple rain, we typically do not have unquestionable evidence about the rather complex situations that weak island violations tend to describe, e.g., that you are wondering whether to invite a particular person, cf. (35b). This provides an explanation of why such questions are notoriously bad. On the other hand, in some situations we do have such evidence. E.g., seeing someone madly searching through the dictionary, we may ask (37) or, one thief, seeing another trying to smuggle an item back to a house just robbed, may ask (38):

(37) What the hell do you still not know how to spell?
(38) What the hell are you upset that you took?

Tetsuya Sano (p.c.) informs me that these intuitions are parallelled by the interpretation and behavior of *ittai*-phrases in Japanese. I interpret these data as indicating that D-linking is not the critical factor in the behavior of *wh-the-hell* expressions; they are bad extractors for independent reasons.

These remarks have been intended to support the claim that the crucial feature of island-escapers is semantic. It appears that discourse context never makes a minimal difference for extractability. D-linking plays an important role when it forces, and facilitates, the individuation of a domain that is originally not individuated; but it is the ensuing semantic change, the creation of an unordered set, that matters for extractability.[5]

3.1 Weak islands and monotonicity

Let us now turn to weak islands themselves. Sz&Z observe that the contexts Rizzi and Cinque characterize as weak islands share some simple monotonicity properties: they are all either DOWNWARD MONOTONE or NON-MONOTONE.

---

[5] Two remarks on the data. (i) There are significant cross-linguistic differences in the behavior of wh-phrases. E.g., Dutch *welk* and Hungarian *melyik* are much less D-linked than *which* (but extract just as well). Or, Hungarian *mikor*, in contrast to *when*, ranges over individuals well and is a good extractor. (ii) In the Eighties *why* was the paradigmatic island-sensitive example, but it seems quite atypical: it is captured by any 'interesting' thing in sentence. The same holds for German *warum*, even though it can stay in situ (T. Kiss 1991, H. van Riemsdijk p.c.).

(39) a. A function f is upward monotone if for every A, B in its domain, if A $\subseteq$ B, then f(A) $\subseteq$ f(B).
b. A function f is downward monotone if for every A, B in its domain, if A $\subseteq$ B, then f(A) $\supseteq$ f(B).
c. A function f is non-monotone if neither (a) nor (b).

Let us briefly review how the material in **1.1** fits these notions. *Not, no one* and *deny* are clearly downward monotone; by the same token, we predict that *few men* and *at most five men* also create weak islands. Wh-phrases, factives like *regret*, *only*-phrases, and *beaucoup* 'a lot' are analyzed as non-monotone. Since some of these items are focus-sensitive, I try to keep the focus structure of the examples constant:[6]

(40) a. [I know the answer to the question] who/whether he exercises ←/→
b. [I know the answer to the question] who/whether he does pushups
(41) a. John regrets that I exercise ←/→
b. John regrets that I do pushups
(42) a. Only John exercises ←/→
b. Only John does pushups
(43) a. John exercises a lot ←/→
b. John does pushups a lot

By the same token, we predict that *exactly five men* and *often*, etc. also create weak islands. On the other hand, items like *think, John, everyone, two men*, etc., which do not create weak islands, are UPWARD MONOTONE. (It is difficult to find a good sample of extraposition islands that are not also factive islands; no proposal is made for them in Sz&Z.)

---

[6] Some comments on (41) and (43). (41) is clearly invalid in the b→a direction. The a→b direction may be tempting, but (b) has a more specific presupposition than (a), whence it cannot be entailed by (a). Some factives like *know* are upward monotone if taken extensionally. See Ladusaw (1980) on both points. In (43), the non-monotone analysis of *beaucoup, a lot*, etc. is inspired by Westerståhl (1985), who proposes four interpretations for *many*, two of which are non-monotone due to context-dependence. Suppose John does nothing but pushups for exercise. What he does may count as a lot of pushups but not as a lot of exercise, if the norms associated with the two are different. De Swart (1991) points out that on this view *seldom* would be non-monotone, too, which contradicts its ability to license negative polarity items. But this may be more of a problem for NPI-theories than for us: *only John* and *regret* are also NPI-licensers and non-monotone.

This descriptive characterization avoids some analytical problems that arise on Rizzi's and Cinque's analyses. They include the movement of *deny*, a head, into an A-bar specifier position at LF and the assumption that the complement of *regret* is not a sister to the verb. These have an alternative solution within Relativized Minimality, however: the adoption of Progovac's (1988) and Melvold's (1991) proposals to place empty operators in the [SPEC, CP] of the complements of *deny* and *regret*, which then serve as standard interveners. More important perhaps is the problem posed by the cross-linguistic variation in the syntax of negation. Recent work has attributed the variation to the fact that the negative particle may be a head, a specifier, or an adjunct. This would suggest that the island-creating effect of negation varies accordingly, but it does not: I am not aware of any language in which negation does not create a weak island. Rizzi (1992) proposes to solve this problem by assuming an empty A-bar specifier when NEG is a head, and vice versa. But this solution makes the original claim almost vacuous; it seems more natural to trace back the cross-linguistically uniform effect to the uniform semantics of negation.

The most important question is why downward monotone and non-monotone contexts constitute weak islands. The definitions in (39) make it clear that upward monotonicity means simply that the function PRESERVES PARTIAL ORDERING; downward monotone functions reverse it and non-monotone ones obliterate it. Now recall that in the previous section I argued that island-sensitive phrases are characterized by the fact that they range over a partially ordered domain. It seems entirely natural for such a phrase to require that order be preserved by the path connecting it to its extraction site. On the other hand, wh-phrases that range over individuals do not have a partial order in their domain. Hence they cannot possibly be sensitive to the preservation of order and must be immune to weak islands -- which they are.

In sum, there seems to be a very natural connection between the semantic properties of islands and island-sensitive phrases.

3.2 Problems

The problems with the above proposal come in two varieties: descriptive and conceptual.

(44) There are downward monotone and non-monotone interveners that for many speakers do not create weak islands.

(45) There are upward monotone interveners which do create weak islands.

(46) Two downward monotone items in the path do not (regularly) cancel out.
(47) The explanation of why downward monotone and non-monotone paths are islands is not as strong as it should be.

Let us consider these in turn.

First, Sz&Z predict that all non-upward monotone interveners are equally bad. But many speakers report a contrast between (48a) and (48b,c):

(48) a.* How did few people think that you behaved? MON↓
b. How did exactly five people think that you behaved? −MON
c. How did at most five people think that you behaved? MON↓

Second, Sz&Z predict that all upward monotone interveners are harmless.[7] De Swart (1991) examines *combien*-extraction and Dutch *wat voor*-split, and observes that clearly upward iterative adverbs like *twee keer* 'twice' create as bad islands as downward monotone ones. She also reanalyzes *beaucoup, veel* 'a lot' as upward monotone; this may be a matter of debate, cf. note 6, but 'twice' alone is sufficient to establish her case:

(49) a. Wat voor boeken heb je twee keer gelezen?
what for books have you twice read
'What (sort of) books have you read twice?'
b.* Wat heb je twee keer voor boeken gelezen?
what have you twice for books read

Third, the most natural implementation of Sz&Z's proposal, as was mentioned in **1.2**, is to assume that interveners between the wh-phrase and its trace are composed into one big function, each contributing its own semantic properties to the result. This predicts that examples containing two downward monotone interveners are grammatical, since the composition of two downward monotone functions is upward monotone. Now, there is at least one case when this is borne out:

(50) a.* John is our hero, as you deny.
b.* John is our hero, as no one knows.
c. John is our hero, as no one denies.
d. John is our hero, as you know.

Many of our informants report that they sense an improvement with wh-extraction, too, but it does not prove significant under closer scrutiny:

---

[7] Szabolcsi and Zwarts (1991) has a chapter on 'gradience', but its data are not built into the theory. I will return to this below.

(51) a.* How did he deny that you behaved?
b.?? How did no one deny that you behaved?

In view of this last observation one may choose to abandon the path-minded formulation of the hypothesis, and use monotonicity properties to characterize bad interveners. This, however, makes the explanation somewhat stipulative.

Fourth, Sz&Z point out that the link between the partially ordered nature of sensitive extractors and the non-upward monotone nature of weak islands is not as strong as it should be. The theory explains clearly why individuals CANNOT be sensitive to weak islands, and why non-individuals CAN be. But it does not explain why they ARE sensitive, i.e., exactly what goes wrong when partial ordering is not preserved.

Individually, these descriptive and conceptual problems are not devastating; they might be seen as calling for further research. Together, however, they indicate that the explanation is on the wrong track.

To see an important source of the problems, let us recall a crucial assumption of the Relativized Minimality theory (RM). The theory of LF that RM relies on is that of May (1985). According to this theory, structure (usually) does not disambiguate scope. (52), for instance, is assigned a single structure in which *how* is higher than *everyone*, but they govern each other, whence they can be interpreted in either scope order or even independently. The adoption of this theory for the purposes of RM results in the assumption that it does not matter which reading of the sentence we are considering; all we have to know is that *everyone* is in an adjoined position, whence its intervention between *how* and its trace must be harmless. (53) is also assigned a single structure, but *no one* occupies an A-bar specifier position in it, whence it must block *how*-extraction.

(52) How did everyone behave?
(53) * How did no one behave?

Sz&Z followed RM in this respect. The claim that certain interveners hurt because, being A-bar specifiers, they break a government chain, was replaced by the claim that they hurt because non-upward monotone paths do not preserve partial order -- but the assumption that upward monotone interveners QUA INTERVENERS are harmless became part and parcel of the theory.

Results by É.Kiss' (1991) and de Swart (1991) indicate that this assumption is wrong. In addition to pointing out the island creating effect of iterative adverbs, cf. (49), de Swart also notes that sentences like (54) are potentially ambiguous, and they are ungrammatical on the narrow scope universal reading. And, as we shall see, (52) is also ungrammatical on the same reading.

(54) Combien ont-ils tous lu de livres?
how many have they all read of books
'For each of them, tell me what number of books he read'
*'For what number, they all read that number of books'

In retrospect, the conclusion that upward quantifiers are not harmless when they expressly take narrow scope had been anticipated in Szabolcsi (1983, 1986) and in Szabolcsi and Zwarts' (1991) chapter on gradience in the strength of islands. Because of the conflict with RM, however, the pertinent data were excluded from the core set on which the Sz&Z account was based.[8]

4 Weak islands and scope

In what follows I will assume that weak islands are a scope phenomenon. That is, I adopt the following informal version of É.Kiss' (1991) and de Swart's (1991) proposals as a point of departure:

(55) The weak island effect comes about when the wh-phrase should take wide scope over some operator but it is unable to.

(56) Harmless interveners are only harmless in that they can give rise to at least one reading that presents no scopal conflict of the above sort: they can 'get out of the way'.

É.Kiss and de Swart present their proposals in terms of filters.[9] Developing a formal semantic explanation, at least two questions need to be asked:

(57) Why are non-individual wh-phrases restricted in their scope-taking abilities?

(58) What interveners are able to 'get out of the way', and how?

---

[8] Whether Relativized Minimality can be restated to cope with these data is left as an open question. The restatement would involve a modified concept of LF and/or a modified definition of relevant interveners.

[9] (i) 'Specificity Filter: If Op_i is an operator which has scope over Op_j and binds a variable in the scope of Op_j, then Op_i must be specific' [in the sense of Enç (1991)]. (Kiss 1991)

(ii) 'A quantifier Q_1 can only separate a quantifier Q_2 from its restrictive clause if Q_1 has wide scope over Q_2.' (De Swart 1991)

In the following sections I will focus on (57). An answer to (58) is to be developed in Szabolcsi and Zwarts (1992), within the context of how scope behavior is determined by the meanings of the specific quantifiers. Before turning to (57), however, I provide a brief overview of some results in the literature that pertain to (58), and indicate their relation to the monotonicity hypotheses in Sz&Z.

An intervener[10] is harmless iff (i) it is scopeless, or (ii) it can take wide scope over the wh-phrase (family of questions reading), or (iii) it can participate in a scope independent reading with the given wh-phrase (branching, cumulative, etc. readings). The reason why (Relativized Minimality and) Sz&Z's proposal could be descriptively almost correct is that typically, though not all and only, upward monotone items have options (i) through (iii).

Let us first restrict our attention to quantifiers. The case of (i) is rather straightforward: Zimmermann (1991) shows that principal ultrafilters are SCOPELESS. As regards (ii), both Groenendijk and Stokhof (1984) and Higginbotham (1991) claim that all quantifiers that are not downward monotone can give rise to a FAMILY OF QUESTIONS reading. These quantifiers have non-empty minimal elements (=sets of individuals); the question is to be answered for each individual in some MINIMAL ELEMENT. Definites and, in general, universals, denote filters: they have a unique not necessarily empty minimal element (e.g., in the case of ‖*the men*‖ and ‖*every man*‖, the set of men). Here we get the classical pair-list answers (see also Chierchia (1992)). Indefinites have more than one minimal element (e.g., the minimal elements of ‖*two men*‖ are all two-member subsets of the set of men). In this case the answerer has to choose one minimal element and give a pair-list answer for the individuals in it. G&S call this a choice reading.

(59) Who did every man see?
Man$_1$ saw Mary, man$_2$ saw Susan, etc.
(60) Who did two men see?
For instance, John saw Susan, and Bill saw Jill.

It is remarkable that according to G&S, both *exactly five men* and *at most five men*, which were found problematic in (48), give rise to the choice reading (the latter does because it is supposed to allow for an upward monotone group reading). Downward monotone quantifiers do not support the family of questions reading, since their minimal element is empty.

These generalizations need significant refinement; for instance, they do not explain the observation (de Swart's and our own) that adverbs like *twice*, *a lot*, and even *always*, and modified indefinites like *at least two men*, do not give rise to family of questions readings. Another salient fact to be explained is that the family of questions reading is not available in every language, e.g., in Hungarian. But even in this preliminary form they provide a partial explanation of why downward monotone interveners were found to create weak islands. As they do not give rise to the family of questions readings, at least one option to 'get out of the way' is unavailable to them.

---

[10] The notion 'intervener' needs to be made more precise. Cases of the type **Who didn't destroy this city?* will show that any item that crucially enters into the computation of an answer counts as an 'intervener', even if it syntactically does not intervene between the wh-phrase and its trace.

As regards (iii), three kinds of scope independent readings have been noted in the literature: BRANCHING (Barwise 1979), CUMULATIVE (Scha 1981), and intermediate ones (van der Does 1992, Verkuyl 1992).

(61) Three students read two books. (branching)
'There is a set S of three students, and there is a set B of two books, and every member of S read every member of B'
(62) Three students read two books. (cumulative)
'There is a set S of three students, and there is a set B of two books, and every member of S read at least one member of B, and every member of B was read by at least one member of S'

Liu (1990, 1991) conducted an empirical study of what noun phrases participate in branching readings in sentences like (61). She identifies a subset of noun phrases denoting upward monotone quantifiers; she calls them G(ENERALIZED)-SPECIFIC. These include definites, universals, and indefinites not modified by *at least*, *at most* or *exactly*; wh-phrases are also among them. A branching analysis is always available whenever both noun phrases are G-specific. (No similar study of the restrictions on cumulative readings has been carried out yet.) Questions that may be analyzed as exhibiting these readings are as follows:

(63) How many circles did everyone draw? (branching)
'Everyone drew the same number of circles -- how many was it'
(64) How many circles did these two people draw? (cumulative)
'altogether how many circles'

In a chapter on GRADIENCE, Szabolcsi and Zwarts (1991) observed that downward monotone interveners create the most robust weak islands, while Liu's G-specific noun phrases are the most innocent even among the upward monotone ones. These observations are immediately explained once we think about weak islands in terms of scope. Downward NPs have only a narrow scope reading, whereas G-specific Nps have the greatest number of non-narrow scope readings. (Below I return to the question why independent readings are good.)

Going beyond quantifiers, note finally that intervening scopal particles (NEG) and verbs (*deny*, *regret*) have no chance to 'get out of the way'. The same holds for intervening wh-phrases: if *who* in **How do you wonder who behaved?* took matrix scope, the subcategorization of *wonder* would be violated.

Although much more work is needed to clarify the semantic conditions of scope interaction between wh-phrases and quantifiers, with this I take it that the global plausibility of the scope account is established.

5 Individuality and scope

This section addresses the question why certain wh-phrases cannot take wide scope and are thus sensitive to weak islands. I will adhere to the claim, advanced in Sz&Z and elaborated in **2**, that the crucial property these wh-phrases have is that they do not range over individuals, i.e., over members of unordered sets. The essence of the claim to be put forth is as follows:

(65) For a wh-phrase to take wide scope over another scope bearing element SBE means that operations associated with SBE need to be performed in the domain of wh in order to compute an answer. When a wh-phrase ranges over discrete individuals, these can be collected into unordered sets. All Boolean operations can be performed on sets. When a wh-phrase does not range over discrete individuals, only a smaller set of operations (possibly none) are available in its domain, hence answers cannot be computed in the general case.

Discussion will proceed in three steps. Section **5.1** justifies claim (65). **5.2** provides new empirical support for the claim that it is precisely this notion of individuality that plays a role here. It will be shown that when some argument of a verb necessarily denotes a sum, it is affected by weak islands, however 'referential' it may be in thematic role or discourse terms. **5.3** argues that whether a domain consists of sums or unordered sets depends on whether the predicate is iterative and summative in the pertinent respect.

5.1 Scope and operations

Let us begin by asking what 'taking wide scope' means (for present purposes, at least). Consider the following questions, on the wide scope *who* reading:

(66) Who did Fido see?
(67) Who didn't Fido see?
(68) Who did every dog see?
(69) Who did at least two dogs see?

I assume that the interpretation of questions, whatever it should precisely be, includes that an exhaustive list is determined by the answer. I will be concerned with how such a list can be computed or verified.

The steps to be described will of course be unsurprising. For (66) we form the set of people that Fido saw, and list its members. For (67), we form the complement of this set. For (68), we take the sets of individuals that each dog saw, intersect them, and list the members of the intersection. If (69) had *at least one dog*, we would simply take the sets of individuals that each dog saw and union them. The presence of *two* makes life more complicated: we have to take a lot of intersections in order to determine whether the same individual shows up in at least two sets. (The algorithm is of no interest here.) These contrast with the pair-list reading of (68), for instance, where no Boolean operation needs to be performed.

The moral is that for a wh-phrase to take WIDE SCOPE OVER some scope-bearing element SBE means that the computation/verification of the answer involves specific OPERATIONS associated with SBE.

Notice three respects in which this definition is rather general. First, it does not require for the narrow scope SBE to become referentially dependent on the wide scope taker, hence SBEs like negation are covered. Second, it does not require for the wide scope taker to 'bind a variable' in the scope of the narrow scope SBE; it is structurally neutral. Third, the definition would easily extend from wh-phrases to arbitrary quantifiers.

In this paper I restrict my attention to simple cases as above, where the operations associated with SBE are just the BOOLEAN operations. I will not try to explicate what operations are involved when a wh-phrase takes scope over a factive verb, for instance.

A simple consequence of the above is that a particular wh-phrase is able to take scope over some SBE iff the requisite operations are available in the domain the wh-phrase ranges over. In (67)-(69) this was no problem. *Person that Fido saw* denotes a set of individuals; an UNORDERED SET. Unions, intersections, and complements are defined for this domain. But are these operations available in the domains of all wh-phrases?

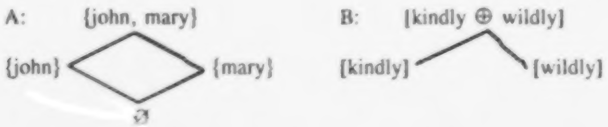
In section 2 I argued that island-sensitive wh-phrases do not range over individuals but, rather, elements of PARTIALLY ORDERED domains. To be more specific, their domain will be said to have the structure of a join semilattice. The following are standard definitions:

(70) a. A BOOLEAN ALGEBRA is a partially ordered set closed under unions, intersections, and complements.
b. A LATTICE is a partially ordered set closed under unions and intersections.
c. A JOIN SEMILATTICE is a partially ordered set closed under unions.

Join semilattices have been proposed for various domains, e.g. mass terms and plurals. Manner expressions resemble mass terms in most respects. For instance, if John behaved kindly but wildly, then the components of his behavior do not form a set {kindly, wildly} but, rather, a single object that is made up of kindness and wildness. The conjunction can be written as *kindly* $\oplus$ *wildly*, where $\oplus$ is interpreted as the sum -- union -- operation. Note that it must be union, not intersection. A kind but wild behavior is not one that has just the features common to both kindness and wildness; it is what you get when you put the two together. It is another matter whether the people who behaved kindly but wildly are in the intersection of those who behaved kindly and those who behaved wildly. (The answer depends on whether we regard *behave* as a distributive predicate; if we do not, only a weaker relation will hold.)

The following diagrams illustrate the structures of a Boolean algebra and a join semilattice:

(71) *that who Fido saw* $\in$ A *the way how John behaved* $\in$ B



The semilattice B is not closed under complements and intersections. Therefore, the computation/verification of an answer must not depend on these operations: an expression that ranges over the elements of a join semilattice cannot take scope over negation or a universal quantifier (or over any more complex operator whose definition inescapably incorporates at least one of these).

The union operation that is available in the join semilattice does allow for some computations, though. For instance, whether entity A is part of entity B, or whether two entities are identical, can be checked using only unions:

(72) a. If $A \subseteq B$, then $A \cup B = B$
b. If $A \subseteq B$ and $B \subseteq A$, then $A = B$

Thus, for instance, the answer to a question like *Did John pay at least three cents?* can be computed by checking whether the amount John paid is bigger than, or equal to, three cents.

(73) has no intersective reading: if Mary behaved clumsily but nicely, Peter loudly but nicely, and John quietly and nicely, (73) cannot be asking for 'Nicely' as an answer. It does have the wide scope universal (family of questions) reading. But, as É.Kiss (1991) observed, it has an additional good interpretation:

(73) How did everyone behave?
'What was the uniform behavior exhibited by everyone?'

This presupposes, rather than asserts, that everyone behaved in the same way. This is an extremely strong presupposition, whence (73) cannot be used as an innocent question. But once this presupposition is granted, we do not need to take intersections. Since everyone behaved in the same way, it is sufficient to inspect an arbitrary person's behavior and report that. This reading can also be regarded as a special instance of branching quantification, with a slight extension of the notion. The two fully connected entities are the set of persons and the unique (full) behavior that characterizes every person. More important to us now is the fact that this reading does not require the performance of intersections.

At this point the question arises why we insist that answers be laboriously 'computed'. Instead, we could just look at every individual in our universe and check whether it exhibits the property of being seen by Fido, not being seen by Fido, being seen by every dog, and being seen by at least two dogs. Let us call this the 'look-up' procedure. For look-up, the properties in (67) through (69) are as simple as the property of being seen by Fido: look-up does not really take cognizance of the fact that *who* is taking scope over some scope-bearing element. Look-up is viable because we assume that each individual is a 'peg', from which all its properties are hanging, cf. Landman (1986).

But this procedure cannot be general. For one thing, we certainly do not want to exclude the possibility of being able to compute even those things that can be looked up. On the other hand, not everything that we can talk about is a 'peg'. For instance, it is natural to look at the Fido-peg and find that Fido is loud and weighs twenty pounds -- but it is not natural to have a loudness peg with the information that Fido is loud, or a twenty-pounds peg with the information that Fido weighs twenty pounds. (Unless, of course, context forced us to individuate loudness and twenty pounds by requiring, for instance, that the presence of these particular properties be checked in every dog.) This means that a question like *How much do at least two dogs weigh?* cannot be answered by looking at every weight peg and finding out whether it exhibits the property that at least two dogs have it. The answer has to be computed by manipulating information obtained by looking at dogs -- and then the question whether the requisite operations are available is crucial.

I am convinced that 'look-up' plays an important role in a pragmatic/procedural model. But it does not eliminate the need for computation, and hence it does not eliminate the vulnerability of wh-phrases that denote in an impoverished domain.

It may be important to point out a difference between the roles this proposal and Sz&Z assign to partial ordering. Take the example of idiom chunks. According to Rizzi (1990), their extraction is sensitive to weak islands because they do not have a referential index. If idiom chunks do not have any reference at all, even an abstract kind, then Sz&Z made the wrong prediction here because such things cannot exhibit a partial order, and hence cannot be interested in its preservation. In contrast, the present proposal makes the correct prediction: idiom chunks do not refer to things that can be collected into unordered sets, whence the Boolean operations are not available for answer computation.

5.2 Unique arguments and weak islands

Although the analysis sketched in **5.1** is logically plausible, one may still be uncertain whether the lack of Boolean structure alone is sufficient to lead to island-sensitivity. In this section I will discuss a set of extractors which, as far as I can see, share nothing else but this aspect with the standard items discussed so far, and are nevertheless systematically subject to weak islands.

The distinction between iterable and 'one time only' predicates is familiar from the aspectual literature. For instance, *show this letter to Mary* and *get a letter from Mary* are iterable: it is possible to show the same letter (token) to Mary, or to get a letter from Mary, more than once. *Get this letter from Mary, destroy this building,* and *win the Rimet Cup in 1978* are 'one time only' predicates: it is not possible to get the same letter (token), or to destroy the same building (token), more than once; similarly for winning the Rimet Cup, a unique object, in a given year. But *get one's favorite letter from Mary* is again not a 'one time only' predicate, due to the bound variable.

Here I will be concerned with a specific consequence of the 'one time only' property, namely, that it imposes a unicity requirement on the arguments and the adjuncts of the predicate. This can be demonstrated as follows. In the iterable (74) examples the distributive answer *John did and Bill did* is as acceptable as *John and Bill did*. In 'one time only' (75), the former is unacceptable: John and Bill must form a collective recipient . Similarly, in (74) the short (exhaustive) answer *Bill* can be modified by *only*. In (75) it cannot or, more precisely, if *only* is acceptable, it must mean 'alone' and not 'exclusively'. The effect disappears in (76).

(74) a. Who showed this letter to Mary?
John and Bill did / John did and Bill did.
Bill did / Only Bill did.
b. Who got a letter from Mary?
John and Bill did / John did and Bill did.
Bill did / Only Bill did.
(75) a. Who got this letter from Mary?
John and Bill did / * John did and Bill did.
Bill did / (*) Only Bill did.
b. Who destroyed this building?

John and Bill did / * John did and Bill did.
Bill did / (*) Only Bill did.
c. Who won the Rimet Cup in 1978?
Argentina did / * Only Argentina did.
(76) Who got his favorite letter from Mary?
John and Bill did / John did and Bill did.
Bill did / Only Bill did.

The same observations apply to other arguments and adjuncts, e.g.,

(77) From whom did you get this letter?
From Mary / (*) Only from Mary.
(78) When did you get this letter?
Yesterday / Only yesterday [=not earlier].

This phenomenon, together with its consequences for scope, was observed in Szabolcsi (1986: 334-7). In what follows I will somewhat enlarge the set of data and spell out the explanation in terms of the present proposal.

(79) and (80) indicate that the *who* subject or experiencer of an iterable predicate can take scope over negation or a universal, while the *who* subject or source of a 'one time only' predicate cannot. (An existential would eliminate the 'one time only' property in the latter case, so it cannot be tested.) (81) and (82) show a similar contrast with a factive and a wh-island; a PP argument is extracted in order to eliminate irrelevant difficulties with subject extraction.

(79) a. Who didn't show this letter to Mary?
To whom didn't you show this letter?
b.* Who didn't get this letter from Mary?
From whom didn't you get this letter?
(80) a. Who showed every letter to Mary?
To whom did you show every letter?
b.* Who got every letter from Mary?
From whom did you get every letter?
[unless pair-list or same person for every letter]
(81) a. To whom do you regret having shown this letter?
b.* From whom do you regret having gotten this letter?
(82) a. To whom do you wonder whether I showed this letter?
b.* From whom do you wonder whether I got this letter?

The sensitivity of these arguments to weak islands cannot be explained with reference to thematic roles or discourse factors. The thematic roles are equally 'referential' in all cases, and there can hardly be a coherent notion of D-linking or specificity that would distinguish the 'one time' arguments from the others. On the other hand, the absence of the unicity requirement means that *show this letter to Mary* denotes a set of individuals of whom the predicate holds independently, whereas the presence of the unicity requirement means that *get this letter from Mary* denotes a sum of whose parts the predicate does not hold independently:

(83) ιx[get the letter from Mary (x)] = [John $\oplus$ Bill]

Since sums form a semilattice, the explanation in the previous section carries over.

A last interesting point to note here is that exactly the same effect is observed whether the sum-term is a subject or a source, although in the former case negation and the object universal do not syntactically intervene between the wh-phrase and its trace. This supports the definition of wide scope taking given in the previous section, which refers to the necessity to perform certain operations in the computation/verification of the answer, rather than to the wide scope taker's binding a variable within the syntactic scope of the other operator.

5.3 Event structure and set formation

In this section I propose a connection between certain properties of predicates and the question whether the denotation of a particular parameter is an element of an ordered or of an unordered set. 'Parameter' serves as a cover term for both arguments and adjuncts in the grammatical sense. Details of answer computation will also be made more precise.

The basic idea derives from Carlson's (1984: 274) suggestion that bearers of thematic roles are unique per event. '... if there is a proposed event with, say, two themes, then there are (at least) two events and not one'. Informal though his proposal is, Carlson is careful to note that on the group reading of *John and Bob threw the chest into the ocean* we have a single event with the collective of John and Bill as its unique Agent, and in *Bob washed the car*, the car is the Theme, and its parts are not.

I dub events characterized by thematic uniqueness MINIMAL EVENTS ($e_{m/\iota}$):

(84) a. visit([Rome])([John])([$e_{m/\iota}$]) entails (b), (c)
b. ιx[visit([Rome])(x)([$e_{m/\iota}$])] = [John]
c. ιx[visit((x)[John])([$e_{m/\iota}$])] = [Rome]

Enclosed in square brackets are objects coming from 'overpopulated' Linkean domains (join semilattices) of various sorts. In adherence to Carlson's intuition, [John$\oplus$Bob], i.e., the sum of John and Bob, is used only if the predicate does not distribute over the parts of the plural object. I will call semilattice objects SLOBJECTS and usually suppress the square brackets.

How do we come to think of the denotations of *visited Rome* and *John visited* as sets of slobjects? I submit that the reason is that these predicates allow us to lump several minimal events together and, at the same time, to collect the unique slobjects corresponding to the pertinent parameter into an unordered set. This requires that the relation between events and objects be summative:[11]

(85) A relation R [between events and objects] is SUMMATIVE iff $R(e,x) \wedge R(e',x') \rightarrow R(e \cup e', x \cup x')$.

Visited Rome is summative: If John visited Rome and Bill visited Rome, then John and Bill visited Rome -- according to the present intuition, the last clause describes a non-minimal event. Similarly for *John visited*. I assume that summativity has to be non-vacuous: it presupposes that it is possible for there to be two distinct events that we can lump together. If the description of the predicate itself involves a parameter, then this means the relation has to be iterable with respect to that parameter. It must be possible for there to be two distinct events involving the same object:

(86) A relation R [between events and objects] is ITERABLE iff $\Diamond \exists e \exists e' \exists e'' \exists y[e' \subseteq e \wedge e'' \subseteq e \wedge e' \neq e'' \wedge R(e',y) \wedge R(e'',y)]$

The *x visited* relation between a minimal event and Rome is iterable. On the other hand, the *x destroyed* relation between a minimal event and Rome is not iterable (in the token sense to which I adhere): the same city cannot be destroyed more than once.

NON-ITERABILITY means that the predicate describes a biunique relation between slobjects and minimal events. I encode this by writing the event parameter as a FUNCTION of that other parameter with respect to which the event is not iterative. (The agent may be so written, too, but it does not seem necessary.)

(87) $\text{destroy(Rome)(Bob)}(f_e(\text{Rome}))$

Prior to proceeding to the description of events involving manners and amounts, let us see how the above assumptions are utilized in set formation. I will use 'set' to mean unordered set, unless otherwise specified.

I stipulate that SET FORMATION takes place iff the predicate is both summative and iterable. On the basis of (84) we can form the standard denotation of the predicate *visit Rome*, the set of those who visit Rome, as follows:

(88) $\lambda x[\exists e \exists I[e = \bigcup_{i \in I} e_{m/i} \wedge x \in \bigcup_{i \in I}\{x: [\text{visit(Rome)}(x)(e_{m/i})]\}]]$

---

[11] This definition as well as (86) and (99) are borrowed from Krifka (1990).

The first step is to form the set of those who visited Rome at some particular minimal event. This will be a singleton. Then, for all minimal events $i \in I$, we union the singletons of those whose visited Rome at $e_{m/i}$, and thus form the set of those who ever visited Rome (within the event range defined by I). At the same time, the minimal events are lumped together into one big event e (here union amounts to sum formation).

The empirical claim that is being made here is that non-iterable and/or non-summative relations do not feed set formation. For instance, the linguistic fact that there can be at most one slobject that destroyed Rome might be expressed by saying that it is an element of the singleton set denoted by *destroy Rome* -- but I will NOT say that. The denotation of a non-iterable predicate remains a slobject. The intuition behind this is that a predicate denotes a set iff it can in principle hold of more than one thing independently. Empirical support for this intuition comes from the data reviewed in **5.2**, i.e., the fact that the questioning of a unique parameter is sensitive to weak islands.

The computation of an answer to *Who visited Rome?* now involves (88), but that of an answer to *Who destroyed Rome?* can involve only (89):

(89) $\iota x[\mathrm{destroy}(\mathrm{Rome})(x)(f_e(\mathrm{Rome}))] = ?$

As regards *Who didn't visit Rome?*, *Who visited every city?*, and *Who visited a(ny) city?*, the reasoning in **5.1** can be reproduced as follows. If we have sets, as in (88), we can form their complements, or we can intersect and union them with others. The outputs also feed the Boolean operations.

(90) $U - \lambda x[\exists e \exists I[e = \bigcup_{i \in I} e_{m/i} \wedge x \in \bigcup_{i \in I}\{x: [\mathrm{visit}(\mathrm{Rome})(x)(e_{m/i})]\}]] = ?$
(91) $\bigcap_{n \in N}(\lambda x[\exists e \exists I[e = \bigcup_{i \in I} e_{m/i} \wedge x \in \bigcup_{i \in I}\{x: [\mathrm{visit}(\mathrm{city}_n)(x)(e_{m/i})]\}]]) = ?$
(92) $\bigcup_{n \in N}(\lambda x[\exists e \exists I[e = \bigcup_{i \in I} e_{m/i} \wedge x \in \bigcup_{i \in I}\{x: [\mathrm{visit}(\mathrm{city}_n)(x)(e_{m/i})]\}]]) = ?$

But since *destroy Rome* does not denote a set, no complement can be formed, and *Who didn't destroy Rome?* is correctly predicted to be ungrammatical. Similarly, *Who destroyed every city?* cannot have a reading parallel to (91). The same sentence is grammatical on the family of questions reading (which does not concern us here) and on the reading which presupposes that the same person destroyed every city, cf. (73). This latter will be expressed roughly as follows:

(93) $\iota x \forall z[\mathrm{destroy}(\mathrm{city}\ z)(x)(f_e(z))] = ?$

It might be tempting to revise the set formation assumptions to allow for an alternative representation of this reading. The intersection of singletons is non-empty iff the singletons are identical:

(94) $\bigcap_{i \in I}\{x: [\mathrm{destroy}(\mathrm{city}_i)(x)(f_e(\mathrm{city}_i))]\} = ?$

However, this interpretation asserts, rather than presupposes, that the same person destroyed every city, which seems counterintuitive. Furthermore, it would predict that a complement can be formed in the next step: *Who didn't destroy every city?* This is wrong, so (93) is the correct representation.

The grammatical *Who destroyed a(ny) city?* may be puzzling: the destruction of each city is non-iterable, but that of an arbitrary city is. Due to the first fact we cannot use (92). But we can capitalize on the fact that precisely in this case the event parameter is a function of the theme, whence they share an index:

(95) $\lambda x[\exists e \exists I[e = \bigcup_{i \in I} e_{m/i} \wedge x \in \bigcup_{i \in I}\{x: [\text{destroy}(\text{city}_i)(x)(e_{m/i})]\}]] = ?$

With these considerations in mind, we can turn to the classical cases of manners and amounts.

First, the slobject denoted by the MANNER parameter is typically a sum:

(96) $\text{behave}([\text{kindly} \oplus \text{stupidly}])([\text{John}])([e_{m/i}])$

Second, while both the *behaved kindly and/but stupidly* and the *John behaved* relations are iterable, summativity fails (we never get cumulative readings):

(97) John behaved kindly at event e and John behaved stupidly at event e´
/→ John behaved kindly and stupidly at e∪e´

(98) John behaved kindly at event e and Bob behaved stupidly at event e
/→ John and Bob behaved kindly and stupidly at event e

As a consequence, set formation does not take place. *How didn't you behave?* and *How did everyone behave?* are both out on the wide scope *how* reading. The latter sentence has a family of questions reading and one analogous to (93).

AMOUNTS may arise in two different ways, cf. *John weighs ninety pounds* and *John visited two cities*. Both require an additive measure: the value assigned to the sum of two non-overlapping slobjects z and z´ is the sum of the values assigned to z and to z´.

(99) The function μ is an ADDITIVE MEASURE iff
$(\neg z \circ z' \wedge \mu(z)=n \wedge \mu(z')=n') \rightarrow \mu(z \cup z')=n+n'$

For the sake of simplicity, I will only examine the *two cities* type. Following Krifka (1990), I take *city* to be the measure function. As long as the measured objects do not overlap, the summativity tests that failed above will work here, and we get cumulative readings:

(100) John visited six cities at e and John visited five cities at e´
→ John visited eleven cities at e∪e´

(101) John visited six cities at e and Bob visited five cities at e
→ John and Bob visited eleven cities at e

These measures are not part of the characterization of the minimal event: measuring is an operation performed on sets or slobjects assembled on the basis of minimal events. In *How many cities did John visit?*, for instance, the set of cities that John visited is constructed and μ is applied to that set:

(102) $\mu(\lambda x[\exists e \exists I[e = \bigcup_{i\in I} e_{m/i} \wedge x \in \bigcup_{i\in I}\{c: [visit(c)(John)(e_{m/i})]\}]]) = ?$

Similarly, a good reading can be computed for *How many cities didn't you visit?*, etc. by measuring the complement of the set of cities visited:[12]

(103) $\mu(U - \lambda x[\exists e \exists I[e = \bigcup_{i\in I} e_{m/i} \wedge x \in \bigcup_{i\in I}\{c: [visit(c)(John)(e_{m/i})]\}]]) = ?$

For the cumulative reading of *John and Bob visited eleven cities*, the two sets of cities are unioned before measuring (I do not provide a general algorithm here):

(104) $\mu((\lambda x[\exists e \exists I[e = \bigcup_{i\in I} e_{m/i} \wedge x \in \bigcup_{i\in I}\{c: [visit(c)(John)(e_{m/i})]\}]]) \cup$
$(\lambda x[\exists e \exists I[e = \bigcup_{i\in I} e_{m/i} \wedge x \in \bigcup_{i\in I}\{c: [visit(c)(Bob)(e_{m/i})]\}]])) = ?$

Measuring differs from the Boolean operations in two respects: its input does not have to be a set, and its output is certainly not a set. For the latter reason μ cannot be followed by the Boolean operations. *How many cities didn't you visit?* is ungrammatical on the reading that asks for the complement of the number of cities visited, and so on.

In other words, there are two reasons why Boolean operations may be unavailable: one is that we were never able to form sets, and the other is that our sets were subjected to an operation whose value is itself not a set.

---

[12] This option is not available for **How many circles didn't John draw?* if drawing is understood as creation, and *John* is not contrastive. This question is equivalent to **How many circles aren't there?*; there is no complement that could be formed. I suggest that to capture this, and the behavior of pure amount readings in general, we measure non-iterable events directly. The elaboration of this suggestion goes beyond the scope of this paper, however.

References

Carlson, Gregory. 1984. Thematic roles and their role in semantic interpretation. Linguistics 22. 259-279.

Chierchia, Gennaro. 1992. Functional wh and weak crossover. Proceedings of the Tenth WCCFL. ed. by Dawn Bates, 75-91. Stanford: CSLI.

Cinque, Guglielmo. 1991. Types of A'-dependencies. Cambridge: MIT Press.

Comorovski, Ileana. 1989. Discourse and the syntax of multiple constituent questions. Cornell University. Doctoral dissertation.

Dobrovie-Sorin, Carmen. 1991. What does QR raise? Paris: CNRS. Manuscript.

van der Does, Jaap. 1992. Applied quantifier logics. Amsterdam University. Doctoral dissertation.

Groenendijk, Jeroen and Martin Stokhof. 1984. Studies on the semantics of questions and the pragmatics of answers. Amsterdam University. Doctoral dissertation.

Harada, Yasunari and Naohiko Noguchi. 1992. On the semantics and pragmatics of *dake* (and *only*). In this volume.

Hepple, Mark. 1990. The grammar and processing of order and dependency: a categorial approach. Edinburgh University. Doctoral dissertation.

Higginbotham, James. 1991. Interrogatives I. More papers on wh-movement (MIT WPL 15). ed. by Lisa Cheng and Hamida Demirdash. 47-76. Cambridge: MIT.

É.Kiss, Katalin. 1991. Wh-movement and specificity. To appear in Natural Language and Linguistic Theory.

Kiss, Tibor, 1991. Some properties of negation in German. Stuttgart: IBM. Manuscript.

Krifka, Manfred. 1990. Four thousand ships passed through the lock. Linguistics and Philosophy 13. 487-520.

Kroch, Anthony. 1989. Amount quantification, referentiality and long wh-movement. University of Pennsylvania. Manuscript.

Ladusaw, William, 1980. Affective OR, factive verbs, and negative polarity items. Proceedings of the Sixteenth CLS. 170-184.

Landman, Fred. 1986. Towards a theory of information. Dordrecht: Foris.

Landman, Fred. 1991. Structures for semantics. Dordrecht: Kluwer.

Liu, Feng-hsi, 1990. Scope dependency in English and Chinese. UCLA. Doctoral dissertation.

Liu, Feng-hsi, 1991. Branching quantification and scope independence. Generalized quantifier theory and applications. ed. by Jaap van der Does and Jan van Eijck. 297-331. Dutch Network for Language, Logic and Information.

May, Robert. 1985. Logical form: its structure and derivation. Cambridge: MIT Press.

Melvold, Janis. 1991. Factivity and definiteness. More papers on wh-movement (MIT WPL 15). ed. by Lisa Cheng and Hamida Demirdash. 97-117. Cambridge: MIT.

Pesetsky, David. 1987. Wh-in-situ: movement and unselective binding. The representation of (in)definiteness. ed. by Eric Reuland and Alice ter Meulen. 98-130. Cambridge: MIT Press.

Progovac, Ljiljana. 1988. A binding approach to polarity sensitivity. University of Southern California. Doctoral dissertation.

van Riemsdijk, Henk. 1987. Movement and regeneration. Tilburg University. Manuscript.

Rizzi, Luigi. 1990. Relativized minimality. Cambridge: MIT Press.

Rizzi, Luigi. 1992. Argument/adjunct (a)symmetries. To appear in the Proceedings of NELS 21.

Rooth, Mats. 1984. How to get even with domain selection. Proceedings of NELS 14. ed. by Charles Jones and Peter Sells. 337-402. Amherst.

Steedman, Mark. 1987. Combinatory grammar and parasitic gaps. Natural Language and Linguistic Theory 5. 403-440.

de Swart, Henriette. 1991. Islands, monotonicity and scope. Groningen: RUG. Manuscript.

Szabolcsi, Anna. 1983. Focussing properties, or the trap of first order. Theoretical Linguistics 10. 125-145.

Szabolcsi, Anna. 1986. From the definiteness effect to lexical integrity. Topic, focus and configurationality. ed. by Werner Abraham and Sjaak de Meij. 321-348. Amsterdam: John Benjamins.

Szabolcsi, Anna. 1992. Combinatory grammar and projection from the lexicon. Lexical matters. ed. by Ivan Sag and Anna Szabolcsi. 241-268. Stanford: CSLI.

Szabolcsi, Anna and Frans Zwarts. 1990. Semantic properties of composed functions and the distribution of wh-phrases. Proceedings of the Seventh Amsterdam Colloquium. ed. by Martin Stokhof and Leen Torenvliet. 529-555. Amsterdam: ITLI.

Szabolcsi, Anna and Frans Zwarts. 1991. Unbounded dependencies and algebraic semantics. 3rd European Summer School in Language, Logic and Information. Saarbrücken. Lecture notes.

Szabolcsi, Anna and Frans Zwarts. 1992. Weak islands. UCLA and Groningen University. Manuscript.

Verkuyl, Henk. 1992. Some issues in the analysis of multiple quantification with plural Nps. Utrecht University. Manuscript.

Westerståhl, Dag. 1985. Logical constants in quantifier languages. Linguistics and Philosophy 8. 387-413.

Zimmermann, Ede. 1991. Scopeless quantifiers and operators. Generalized quantifier theory and applications. ed. by Jaap van der Does and Jan van Eijck. 207-223. Dutch Network for Language, Logic and Information.

Zwarts, Frans. 1986. Categoriale grammatika en algebraïsche semantiek. Groningen: RUG. Doctoral dissertation.

OSU WPL

The Working Papers in Linguistics is an occasional publication of the Department of Linguistics of Ohio State University and usually contains articles written by students and faculty in the department. There are one to three issues per year. Information about available issues appears below. Numbers 1, 5, 10, and 23 are out of print and no longer available.

There are two ways to subscribe to WPL. The first is on a regular basis: the subscriber is automatically sent and billed for each issue as it appears. The second is on an issue-by-issue basis: the subscriber is notified in advance of the contents of each issue, and returns an order blank if that particular issue is desired.

18 $2.00. 183 pp. (June 1975): Papers by Michael Geis, Sheila Geoghegan, Jeanette Gundel, G.K. Pullum, and Arnold Zwicky.

19 $2.00. 214 pp. (September 1975), edited by Robert K. Herbert: *Patterns of Language, Culture, and Society: Sub-Saharan Africa* contains eighteen papers presented at the Symposium on African Language, Culture, and Society, held at Ohio State University on April 11, 1975.

20 $2.00. 298 pp. (September 1975), edited by Robert K. Herbert: *Proceedings of the Sixth Conference on African Linguistics* contains twenty-seven papers presented at the Sixth Conference on African Linguistics, held at the Ohio State University on April 12–13, 1975.

21 $2.50. 252 pp. (May 1976), edited by Arnold Zwicky: *Papers on Nonphonology*. Papers by Steven Boer and William Lycan, Marian Johnson, Robert Kantor, Patricia Lee, and Jay Pollack.

22 $3.50. 151 pp. (February 1977), edited by Olga Garnia: *Papers in Psycholinguistics and Sociolinguistics*. Papers by Sara Garnes, Olga Garnica, Mary Louise Edwards, Roy Major, and John Perkins.

24 $3.50. 173 pp. (March 1980), Edited by Arnold M. Zwicky: *Clitics and Ellipsis*. Papers by Robert Jeffers, Nancy Levin (OSU Ph.D. Dissertation), and Arnold Zwicky.

25 $3.50. 173 pp. (January 1981), edited by Arnold M. Zwicky: *Papers in Phonology*. Papers by Donald Churma, Roderick Goman (OSU Ph.D. Dissertation), and Lawrence Schourup.

26 $4.50. 133 pp. (May 1982), Edited by Brian D. Joseph: *Grammatical Relations and Relational Grammar*. Papers by David Dowty, Catherine Jolley, Brian Joseph, John Nerbonne, and Amy Zaharlick.

27 $4.50. 164 pp. (May 1983), edited by Gregory T. Stump: *Papers in Historical Linguistics*. Papers by Donald Churma, G.M. Green, Leena Hazelkorn, Gregory Stump, and Rex Wallace.

28 $5.00. 119 pp. (May 1983). Lawrence Clifford Schourup, *Common Discourse Particles in English Conversation*, Ph.D. Dissertation.

29 $5.00. 207 pp. (May 1984), edited by Arnold Zwicky and Rex Wallace: *Papers on Morphology*. Papers by Belinda Brodie, Donald Churma, Erhard Hinrichs, Brian Joseph, Joel Nevis, Anne Stewart, Rex Wallace, and Arnold Zwicky.

30 $5.00. 203 pp. (July 1984). John A. Nerbonne, *German Temporal Semantics: Three Dimensional Tense Logic and a GPSG Fragment*, Ph.D. Dissertation.

31 $6.00. 194 pp. (July 1985), edited by Michael Geis: *Studies in Generalized Phrase Structure Grammar*. Papers by Belinda Brodie, Annette Bissantz, Erhard Hinrichs, Michael Geis and Arnold Zwicky.

32 $6.00. 162 pp. (July 1986). *Interfaces*. 14 articles by Arnold Zwicky concerning the interfaces between various components of grammar.

33 $6.00. 159 pp. (August 1986). Joel A. Nevis, *Finnish Particle Clitics and General Clitic Theory*, Ph.D. Dissertation.

34 $6.00. 164 pp. (December 1986), edited by Brian Joseph: *Studies on Language Change*. Papers by Riitta Blum, Mary Clark, Richard Janda, Keith Johnson, Christopher Kupec, Brian Joseph, Gina Lee, Ann Miller, Joel Nevis, and Debra Stollenwerk.

35 $10.00. 214 pp. (May 1987), edited by Brian Joseph and Arnold M. Zwicky: *A Festschrift for Ilse Lehiste*. Papers by colleagues of Ilse Lehiste at Ohio State University.

36 $10.00. 140 pp. (September 1987), edited by Mary Beckman and Gina Lee: *Papers from the Linguistics Laboratory 1985–1987*. Papers by Keith Johnson, Shiro Kori, Christiane Laeufer, Gina Lee, Ann Miller, and Riitta Valimaa-Blum.

37 $10.00. 114 pp. (August 1989), edited by Joyce Powers, Uma Subramanian, and Arnold M. Zwicky: *Papers in Morphology and Syntax*. Papers by David Dowty, Bradley Getz, In-hee Jo, Brian Joseph, Yongkyoon No, Joyce Powers, and Arnold Zwicky.

38 $10.00. 140 pp. (July 1990), edited by Gina Lee and Wayne Cowart: *Papers from the Linguistics Laboratory*. Papers by James Beale, Wayne Cowart, Kenneth deJong, Lutfi Hussein, Sun-Ah Jun, Sook-hyang Lee, Brian McAdams, and Barbara Scholz.

39 $15.00. 366 pp. (December 1990), edited by Briand D. Joseph and Arnold M. Zwicky: *When Verbs Collide: Papers from the 1990 Ohio State Mini-Conference on Serial Verbs* contains eighteen papers presented at the conference held at Ohio State University May 26–27, 1990.

40 $15.00. 440 pp. (July 1992), edited by Chris Barker and David Dowty: *Proceedings of the Second Conference on Semantics and Linguistic Theory* contains twenty papers from the conference held at Ohio State University May 1–3, 1992.

The following issues are available through either: The National Technical Information Center, The U.S. Department of Commerce, 5285 Port Royal Rd, Springfield, VA 22151 (PB) or ERIC Document Reproduction Service (ED) Center for Applied Linguistics, 161 N. Kent St, Arlington, VA 22209.

2 November 1968, 128 pp. (OSU-CISRC-TR-68-3). PB-182 596.

3 June 1969, 181 pp. (OSU-CISRC-TR-69-4). PB-185 855.

4 May 1970, 164 pp. (OSU-CISRC-TR-70-26). PB-192 163.

6 September 1970, 132 pp. (OSU-CISRC-TR-70-12). PB-194 829.

7 February 1971, 243 pp. (OSU-CISRC-TR-71-7). PB-198 278.

8 June 1971, 197 pp. (OSU-CISRC-TR-71-7). PB-202 724.

9 July 1971, 232 pp. (OSU-CISRC-TR-71-8). PB-204 002.

11 August 1971, 167 pp. ED 062 850.

12 June 1972, 88 pp. (OSU-CISRC-TR-72-6). PB-210 781.

13 December 1972, 255 pp. ED 077 268.

14 April 1973, 126 pp. ED (parts only)

15 April 1973, 221 pp. ED 082 566.

16 December 1973, 119 pp. ED (parts only)